MARINE RADIO TELEPHONE MODEL 1400 VHF/FM

INSTRUCTION HANDBOOK

PRICE
FIVE DOLLARS

RAY JEFFERSON
PHILADELPHIA, PENNSYLVANIA
DIVISION OF JETRONIC INDUSTRIES, INC.

TABLE OF CONTENTS

SPECIFICATIONS

GENERAL

FCC Type Accepted	:	For use under the provisions of Part 2, 15 and 83 (shipboard)
Frequency Range	:	Receive; 153.950 MHz to 162.550 MHz (14 channels) Transmit; 156.275 MHz to 157.425 MHz (12 channels) (Crystal for Channels 6,16,22A,26,28,68,WX-1 and WX-2 and WX-3 are factory installed)
Supply Voltage	:	13.8V DC ±15%, Negative Ground
Current Drain	:	Transmit; 1.5A @ 1W, 5.5A @ 25watts Receive; 0.6A @ Squelched, 1.7A @ Full Audio
Antenna	:	50 ohm
Microphone	:	600 ohm Dinamic
Speaker	:	4 ohm, 3 watts
Size (W x D x H)	:	8" x 9-7/8" x 2-13/16"
Weight	:	5.5 lbs
Accessories	:	DC cord with built in fuse, Microphone and Mounting Bracket

TRANSMITTER

Power Output	:	25 watts at "HI" position 1 watt at "LOW" position
Output Impedance	:	50 ohms unbalanced
Frequency Tolerance	:	±0.001% over the range -20°C to +50°C
Harmonic and Spurious Emission	:	-60 dB or better
Deviation	:	±5 kHz

RECEIVER

Sensitivity	:	0.5μV or less for -20 dB Quieting
Squelch Sensitivity	:	0.35μV at threshold, 1.5μV at tight
IF Frequencies	:	1st IF 16.9 MHz, 2nd IF 455 kHz
Frequency Tolerance	:	±0.001% over the range -20°C to +50°C
Audio Output Power	:	3 watt minimum at 10% distortion
Spurious Rejection	:	70 dB or greater
Modulation Acceptance Bandwidth	:	±7.5 kHz minimum
Adjacent Channel Selectivity	:	70 dB maximum at ±25 kHz

INTRODUCTION

CONGRATULATIONS . . .

on your new Ray Jefferson Model "1400".

You now own all the radio you'll ever need for US MARINE communications.

The Model "1400" is an all solid state, compact, VHF/FM marine radio telephone. It provides US VHF/FM channels designated for marine use.

The unit has been scientifically designed and engineered to operate at maximum efficiency within a marine environment, whether installed aboard a pleasure yacht or commercial vessel. To assure years of trouble free service, the instructions in this manual should be followed precisely.

The Model "1400" is primarily intended for shipboard installation employing nominal 12 volts DC power system.

The Model "1400" has 11 channels, transmit and 14 channels, receive capability.

Your Model "1400" is ready for instant installation. The set is pretuned and designed with special crystal switching circuitry for operation over the entire frequency range. Specific channel frequencies are noted in your Log Book. This book is an important item, and should not be lost. It is needed on board to comply with FCC regulations.

This manual has been prepared with the operator and technician in mind. It should be carefully read prior to installation and before performing any adjustments.

NOTE: TRANSMITTER ADJUSTMENTS ARE ONLY PERMITTED BY AN FCC LICENSED TECHNICIAN HOLDING A FIRST OR SECOND CLASS RADIO-TELEPHONE LICENSE.

A WORD ABOUT LEGAL OPERATION OF YOUR MODEL "1400"

We know you're anxious to install and begin operating your Model "1400". However, before doing so, certain procedures must be followed.

Legal operation of a marine radio telephone requires:

1. A Ship's Station License – available upon application to the Federal Communications Commission, FCC Form 502. (A copy is supplied with the radio.)
2. A Restricted Radio Operator's Permit – available upon application to your local FCC Field Office, with no examination, FCC Form 753A. (A copy is supplied with the radio.)
3. A copy of Part 83 of the Commission Rules, available from the Superintendent of Documents, Washington, D.C. 20402. You are required to read and understand Part 83 prior to operating the radio.
4. Log Book in which you must enter a record of each transmission.
5. A frequency check by a licensed technician. This information to be entered into the Log Book and signed by the technician. (This has been done at the factory.)

LICENSE APPLICATION INSTRUCTIONS

Formal application for a Ship Station License must be made on FCC Form 502.

(**NOTE:** If you already hold a station license for operating a VHF/FM marine radio telephone and are simply replacing your current set with the greater capability of the Model "1400" it is not necessary to apply for a new license or to notify the FCC of any equipment change.)

So that you may legally operate your set while awaiting arrival of your FCC license, the FCC has made provisions for issuance of an interim Ship's Station License. This license will be issued if you or your agent appear in person at the nearest Field Engineering Office of the Commission and submit your completed Form 502, together with your request for the Interim License. The Interim License will allow you to operate your radio telephone for a period of six months from date of issue.

Your Ship Radio Station License will be valid for five years from date of issue. For prompt service and processing by the FCC, Form 502 must be typewritten. Follow the instruction sheet implicity to avoid disappointment and unnecessary delay.

APPLICATION FOR PURCHASE OF RULES

ORDER FORM

TO: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter ..... subscription(s) to Volume IV, containing Parts 81, 83 and 15 of the Federal Communications Commission Rules and Regulations. Make checks or money orders payable to the Superintendent of Documents.

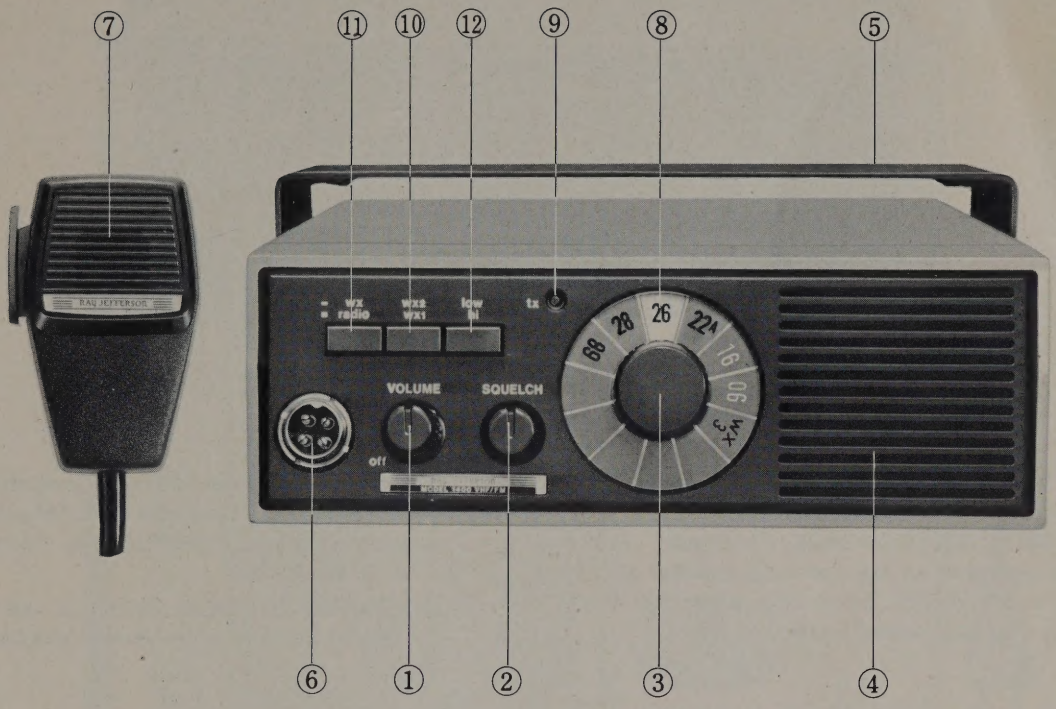
Name_____

Street Address_____

City_____ State_____ Zip Code_____

GETTING TO KNOW YOUR MODEL "1400"

CONTROL FUNCTIONS (FRONT PANEL)



Designed for marine use, the Model "1400" permits quick and easy operation. All controls are conveniently located on the front panel. Control functions, switches and features are:

1. **On-off/volume control:** Turns unit on and adjusts audio output level.
2. **Squelch control:** Adjusts to remove background noise.
3. **Channel Selector:** Selects desired operating channel.
4. **Large front panel mounted speaker.**
5. **Universal gimbal mounting bracket.**
6. **Detachable microphone connector.**
7. **DYNAMIC MICROPHONE:** Push-to-talk, release to listen, Coiled detachable retractable cord.
8. **Channel Indicator:** Indicates operating channel.
9. **Transmit "on" indicator.**
10. **WX-1-WX-2 selector.**
11. **WEATHER/RADIO selector:** Selects either radio or weather mode of operation.
12. **25 watts, 1 watt power selector.**

REAR PANEL CONNECTORS

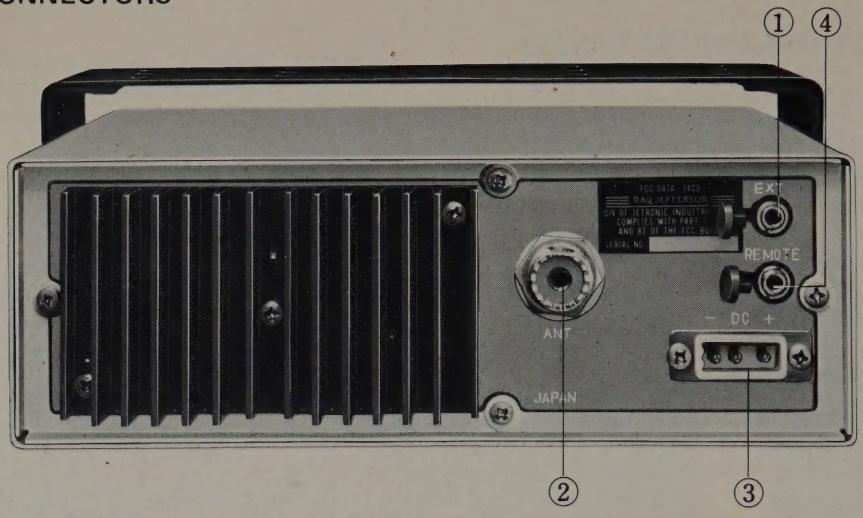


FIGURE 2

There are four jacks on the rear panel of your Model "1400". They are:

1. **EXTERNAL SPEAKER JACK:** The Model "1400" can be used with an external 8 ohm speaker such as the Ray Jeff RS-109. To operate, connect external speaker into jack located on back of set.
2. **ANTENNA CONNECTOR:** Compatible with Ray Jefferson's recommended VHF/FM antennas.
3. **POWER CORD CONNECTOR:** For use with supplied power cord.
4. **REMOTE CONTROL JACK:** For use with Telephone Hand-set to control the built-in speaker.

INSTALLING YOUR MODEL "1400"

Positioning your Model "1400" is important. Obviously, you want it conveniently located within easy reach and free of interfering objects. At the same time, for top efficiency and protection, you want to shield it from the harmful effects of water and salt spray. The Model "1400" is designed for operation in a marine environment with maximum protection against moisture. However, direct exposure to water or salt spray can be harmful to the equipment.

When installing the Model "1400":

1. Select the driest possible location for installation, maintaining at least a 12-inch clearance from your compass.
2. Decide whether you want an overhead or base mount. The mounting cradle can be installed on either the top or bottom of the radio. To separate the bracket from the radio, unfasten the four side screws.
3. Select the most convenient operating location while observing the precaution in Paragraph 1 above. Leave sufficient space around the radio for adequate ventilation. Fasten the bracket to the area chosen with screws or bolts. Re-install the radio in the bracket.
4. Locate the antenna clear of metal objects and as high as possible, preferably the highest point on the boat. The coaxial feed line should be kept as short as possible consistent with set and antenna location consideration. After installing the antenna, connect the cable to the rear panel antenna connector on the back of the set.

(**NOTE:** It is suggested you use Ray Jefferson's recommended VHF/FM marine antennas. The Model "1400" has been pre-tuned for operation with these antennas. If any other antenna is used, the services of a licensed radio technician will be required.)

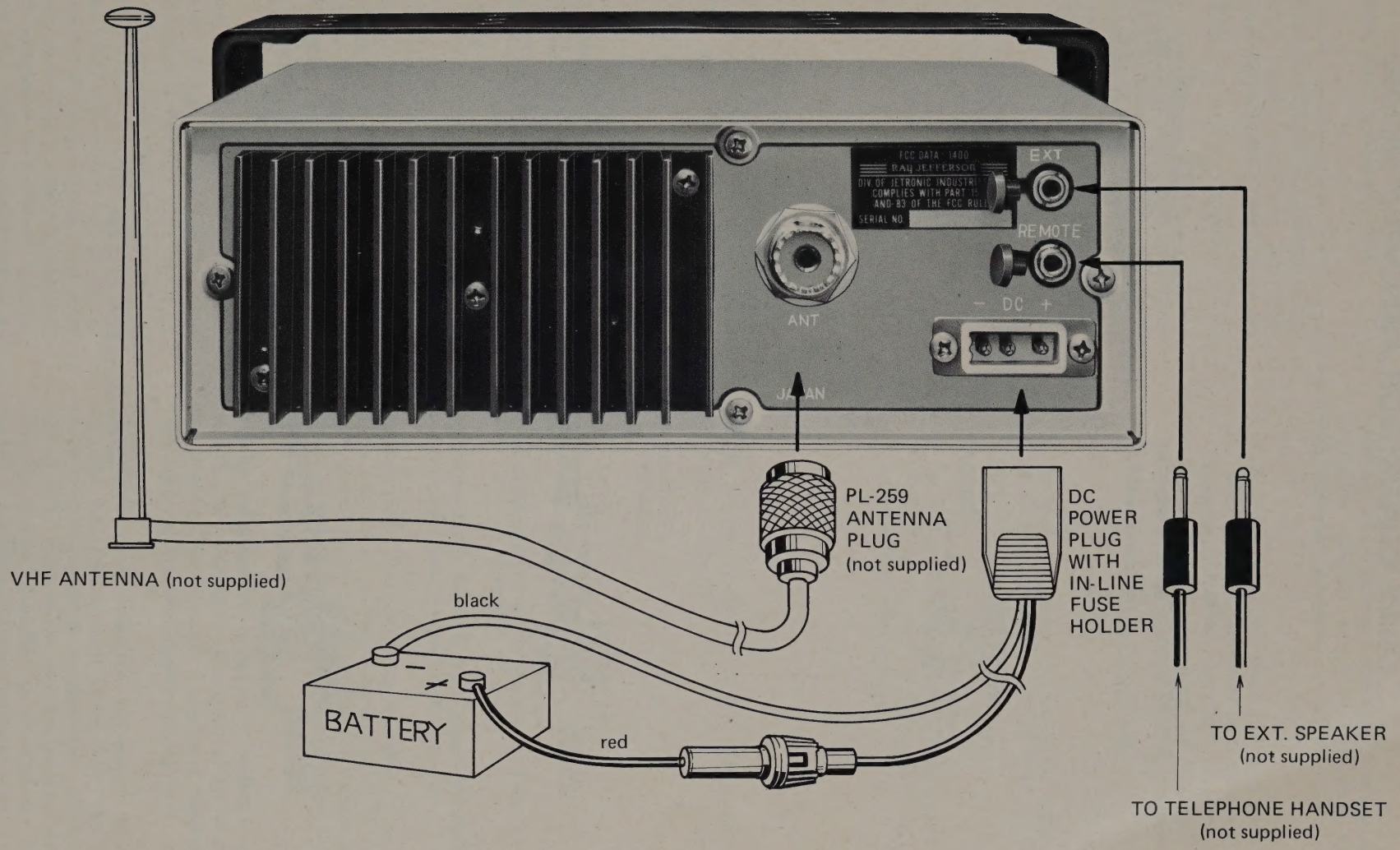
The recommended Ray Jefferson antennas are:

FG3 (for sailboats) 3 dB gain; 54"
FG6 3 dB gain; 54"
FG9 6 dB gain; 8'
FG-21 9 dB gain; 21'

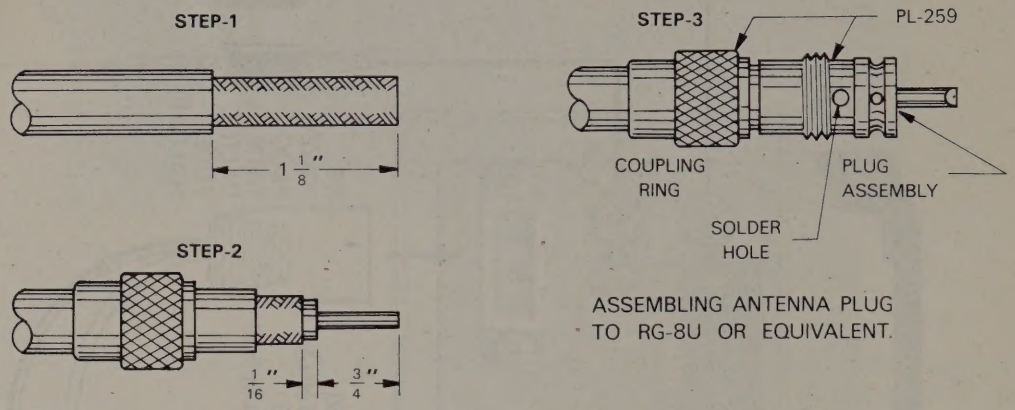
All antennas come complete with required mounting hardware.

5. **POWER CONNECTION:** The Model "1400" is designed to operate from a 12-volt **NEGATIVE GROUND** power source. Do not attempt to use the radio with a positive ground system. Power cable is supplied to make the necessary connections to the boat's battery. It will be necessary to extend the ground wire and the hot wire coming from the power cable connector in order to connect with the storage battery terminals. Use wire no lighter than #12. Connect the ground wire to the negative terminal and the red wire to the positive terminal. The Model "1400" features a safety circuit to prevent transistor burnout. If the unit is incorrectly wired to the power source, a rear panel fuse will blow, protecting the unit from further damage. This fuse is easily replaced with one having the same power rating. (6amp. 3 AG)

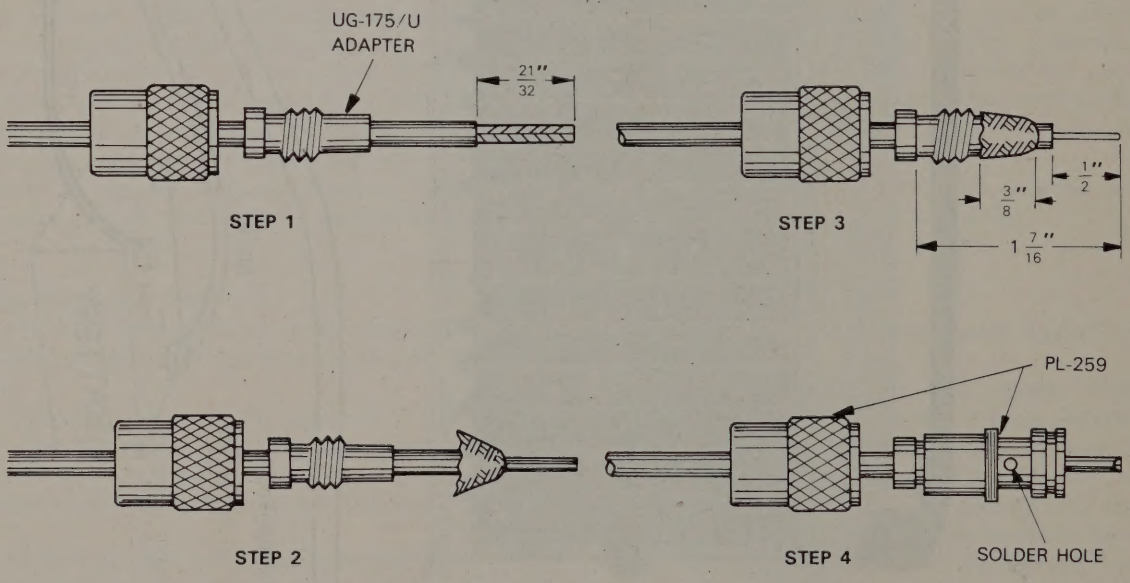
INSTALLATION DIAGRAM



COAX CONNECTOR ASSEMBLY DETAIL



ASSEMBLING ANTENNA PLUG TO RG-8U OR EQUIVALENT.



ASSEMBLING ANTENNA PLUG TO RG-58U OR OTHER ¼" COAXIAL CABLE

OPERATING YOUR MODEL "1400"

Operation of the Model "1400" is simplicity itself.

To Receive:

1. Rotate the VOLUME CONTROL clockwise a few degrees until the switch snaps into the "ON" position. Advance the VOLUME CONTROL to the desired audio level.

2. Place the SQUELCH CONTROL in the fully counter-clockwise position. Advance the SQUELCH CONTROL clockwise until the background noise on an unoccupied channel is reduced to full quieting. Do not advance the control beyond this point.

3. Select the channel desired by channel selector switch or WX1-WX2 switch.

To Transmit:

The operation of the transmitter and receiver is controlled by the "Push-to-talk" switch located on the side of the microphone. When depressed, the transmitter is placed into operation and the receiver becomes inoperative. When released, the receiver is automatically restored to operation and, at the same time, the transmitter becomes inoperative.

1. Place the "HI-LOW" switch in either the "HI" or "LOW" position dependent on the range of desired communications. In the "HI" position, the set operates at full 25 watt power for maximum output. In the "LOW" position, the set operates at one watt of power.

2. The Indicator Lamp, located on the upper left side of the Channel selector will be "ON" whenever the transmitter is activated.

3. Do not use obscene or profane language when transmitting. To do so is a violation of federal law subject to stiff consequences.

NOTE: Do not attempt to transmit unless your antenna is properly connected.

NOISE SUPPRESSION

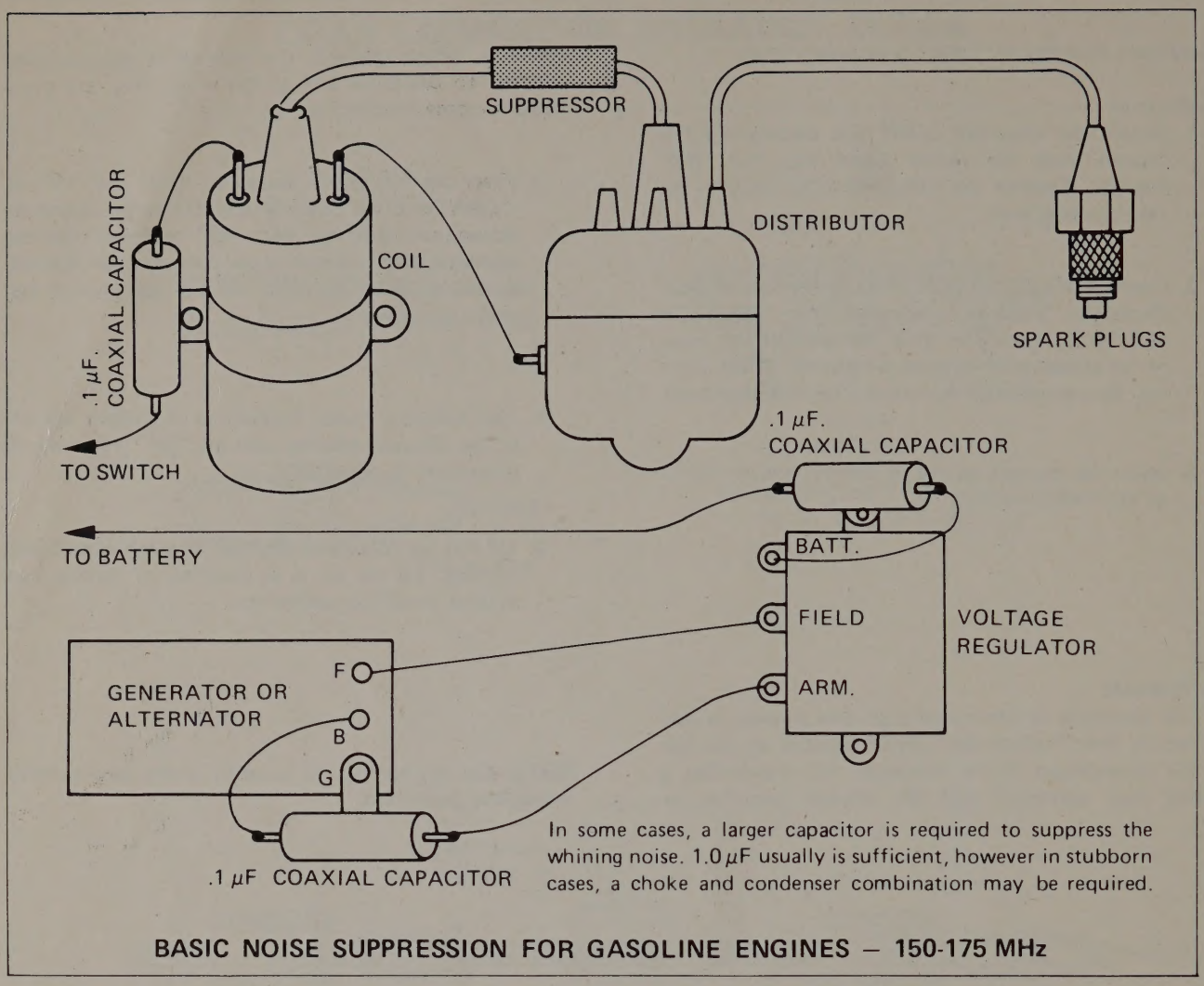
While light ignition noise interference is not as bothersome on VHF/FM as it is on other bands, noise suppression should be done even though it does not seem to be bothersome. Noise pulses chop "holes" in the received signal and weaker stations can be completely blanked out. The following procedure for basic noise elimination will also improve reception on other radios and direction finders and provide better operation of all types of depth sounders.

Spark Plugs: On some makes of engines, Champion "U" type spark plugs (such as UJ6) are specified. We have found that it is impossible to eliminate noise caused by these plugs as they have an extra spark gap near the top of plug which causes the leads to radiate this noise. The remedy is to replace these with resistor type plugs, or, better yet, use standard spark plugs with the new MSW cables. This cable looks like ordinary cable, but instead of a solid or carbonized conductor, it consists of a coiled winding of monel wire over a ferrite core which acts as an RF choke reducing the noise to a very low level. As this wire has a very low resistance compared to the usual suppressors, there is no loss in engine performance. These cables are sold in complete sets packaged for most engines and can be snapped in place in a few minutes.

Ignition Coils: Coils should be mounted on the engine. Clean away paint to insure good ground. Certain coils such as the Mallory plastic encased unit radiate excessive noise and should be replaced with a standard metal case unit.

Voltage Regulators: Older types of regulators contain a vibrating set of contacts to control voltage. If the usual capacitors do not quiet the frying noise, replace with a solid state regulator which has no moving parts.

Tachometers: Some electrical tachometers cause considerable radiation of spark noise. This type of tach connects to the points at the distributor. Disconnect the tach wire at the distributor and note the noise reduction. This lead should be shielded or a special tach filter installed. If Sun tachs are used, all wires must be shielded and the plastic cased sender unit which contains a vibrating set of contacts should be completely shielded in a metal enclosure.



BASIC NOISE SUPPRESSION FOR GASOLINE ENGINES – 150-175 MHz

THEORY OF OPERATION

Detailed description of circuit by each block is in order. Refer to the block diagram, and circuit diagram for the following description of circuit function and operation.

RECEIVER CIRCUIT

RF circuit: Signal from antenna connector passes dual tuned band pass filter and is amplified by Q101, and is fed into FT101 band pass filter. The signal is then mixed with signal from local oscillator at Q102 first mixer, and produces first IF 16.9MHz. This IF signal is then passes FT102 crystal filter, and is mixed at FT103 2nd mixer with signal from Q106 second local oscillator(16.445MHz), and produces 2nd IF 455KHz. The 2nd IF passes Q103 ceramic filter, and is amplified by Q104 and Q105 then is limited by IC101. This signal is then detected by FT104 ceramic descriminator and fed into AF circuit.

AF circuit: AF signal from FT104 is amplified by Q109 and IC103 and drives speaker while, noise signal from FT104 is amplified by IC102 and Q107 then is detected by D103 and D104 and is drives switching transistor. The transistor Q110 controls IC103 AF amplifier and activates squelch.

TRANSMITTER CIRCUIT

Signal from microphone is amplified by Q320 and is fed to Q316 via IC301 Instantaneous Deviation Control and Low Pass Filter. The Frequency Modulated signal at Q316 is then buffered by Q317 and is amplified and then multiplied by 2 times at Q318. Then it is further amplified and multiplied by 3 times at Q319. This signal is then fed to IC201 mixer thru D210 receive/transmit switching control. Q207 and Q208 are switching transistors which selects SIMPLEX or DUPLEX modes. Q209 is a switching transistor which is used to tune L204 with 12.3MHz. The resultant RF signal from IC201 mixer is amplified by Q205/Q204 and is fed to Q201 final amplifier via Q203 predriver and Q202 driver. The RF signal from Q201 is then fed to antenna thru low pass filter.

ALC CIRCUIT

The DC voltage which is proportional to the RF output is detected by D203. This DC voltage is then amplified by Q210, 211, 212 and 213. The output voltage from Q213 controls the collector voltage of Q203 predriver, thus the RF output level at Q203 is kept in constant level.

APC CIRCUIT

When the antenna terminal is not properly loaded with the antenna or load during a transmission, the RF voltage will be reflected back to the circuit and this may cause of damage to the transceiver. To prevent this problem, the following function is provided; the reflected voltage is taken by L210 and is rectified by D202 into DC component. This component is then amplified by Q210/211 and then is fed to Q213. Thus, Q213 turns "OFF" which causes the RF output to reduced, in other words, the RF power circuit is protected from reflected voltage occured by inproper antenna load.

LOCAL OSCILLATOR CIRCUIT

The local OSC frequencies are oscillated by Q315 with one of the crystals, X301 thru X314. One of these local frequency is selected by S502 Channel Selector switch or S504 Radio-WX switch or S505 WX1-WX2 switch. The selected local frequency is fed to the base of Q316 modulator. Q301 thru Q314 are switching transistors which select one of the crystals, X301 thru X314.

CAUTION

FCC REQUIREMENTS STATE THAT ALL ADJUSTMENTS MADE TO THE TRANSMITTER BE MADE BY A PROPERLY LICENSED AND QUALIFIED TECHNICIAN. THIS INCLUDES INSTALLATION OF TRANSMITTER CRYSTALS AND ANY TUNING THAT IS DONE TO THE TRANSMITTER CIRCUITRY.

PROPER OPERATION OF THE "1400" CALLS FOR A RESONANT 50 OHM ANTENNA. THE INSTALLATION SHOULD BE CHECKED TO SEE THAT THE ANTENNA DOES NOT PRESENT AN APPRECIABLE STANDING WAVE RATIO. IF A HIGH STANDING RATIO EXISTS, CORRECTIVE ACTION MUST BE TAKEN WITH THE ANTENNA. THE TRANSMITTER SHOULD NOT BE RETURNED IN AN ATTEMPT TO CORRECT FOR A FAULTY ANTENNA SYSTEM.

ALIGNMENT PROCEDURES

GENERAL

THE "1400" HAS BEEN FACTORY ALIGNED USING TECHNIQUES AND TEST EQUIPMENT NOT NORMALLY AVAILABLE TO THE SERVICE TECHNICIAN. IT SHOULD NOT BE NECESSARY TO PERFORM ANY ALIGNMENT ON THE UNIT AS RECEIVED FROM THE FACTORY. IN THE EVENT OF COMPONENT FAILURE, ANY REALIGNMENT WILL BE MINIMAL. IF IT APPEARS THAT ANY LARGE DEGREE OF REALIGNMENT IS REQUIRED, THOROUGHLY CHECK THE REPLACEMENT COMPONENT BEFORE PROCEEDING.

LOCAL OSCILLATOR

1. EQUIPMENT REQUIRED

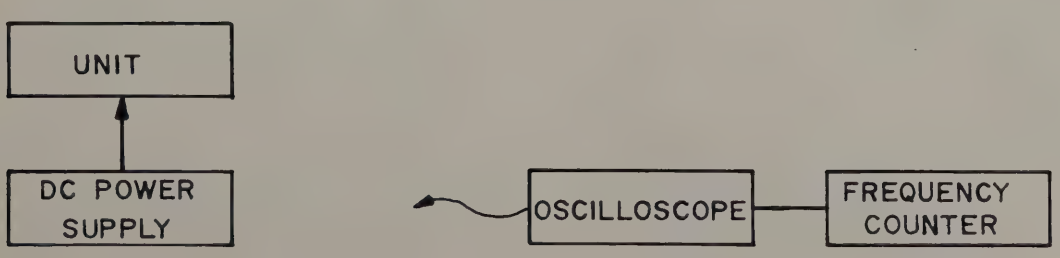
a) 13.8V DC Power Source
b) Frequency Counter
c) Oscilloscope

2. SETUP

Front panel controls should be set in the following manner:

a) Power switch ———— off
b) Squelch control ———— any position
c) Hi-Low switch ———— either position
d) Radio-WX switch ———— Radio position
e) WX1-WX2 switch ———— WX1 position

LOCAL OSC SETUP



3. PROCEDURES

a) Connect the unit to 13.8V DC power source and turn the power switch "ON".

b) Select channel for 22A and connect oscilloscope to TP302 and TP301 (GND). Then adjust L318,320 and 321 for maximum reading on oscilloscope.

c) Change the channel to 06 and adjust L320 and 321 for maximum reading. Repeat this adjustment until voltage reading between channel 06 and WX1 are equalized.

d) Connect frequency counter to TP302 and TP301 (GND), then adjust to obtain the following frequencies at each channels:

Set the channel to:	Adjust	Frequency (MHz)
06	L301	139.400
16	L302	139,900
22A	L303	140.200
26	L304	145.000
28	L305	145.100
68	L306	139.525
WX1	L313	145.650
WX2	L314	145.500
WX3	L312	145.675

NOTE: FOR INSTALLATION OF ADDITIONAL CHANNELS, REFER TO PAGE 13.

RECEIVER

A. RF amplifier section

1. EQUIPMENT REQUIRED

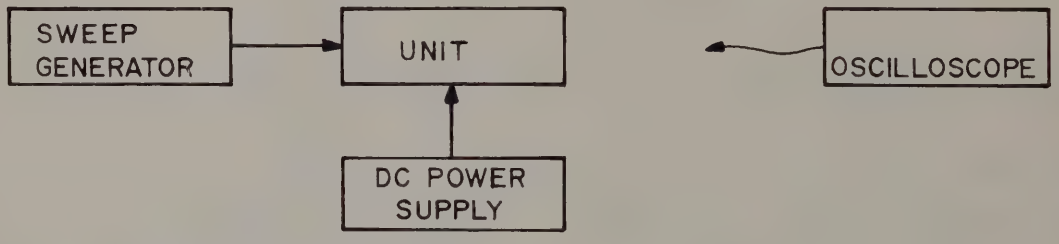
a) 13.8V DC Power Source

b) VHF Sweep Generator

2. SETUP

Front panel controls to be set as same setup as Local oscillator alignment.

RECEIVER SETUP (RF SECTION)



3. PROCEDURE

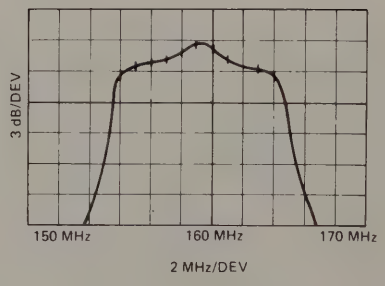
a) Connect the unit to 13.8V DC power source and turn the power switch "ON"

b) Connect the RF output of Sweep Generator to the antenna.

c) Connect the RF input of Sweep Generator (or H input of Scope) to TP101.

d) Adjust L101, 102 and FT101 to obtain a wave form as shown below with the following condition:

Input Level ———— 10mV rms
Marker ———— increment by 1MHz
Center Frequency——— 159MHz
Oscilloscope ———— X 1 range



B. IF Amplifier section

1. EQUIPMENT REQUIRED

a) 13.8V DC Power Source

b) Oscilloscope

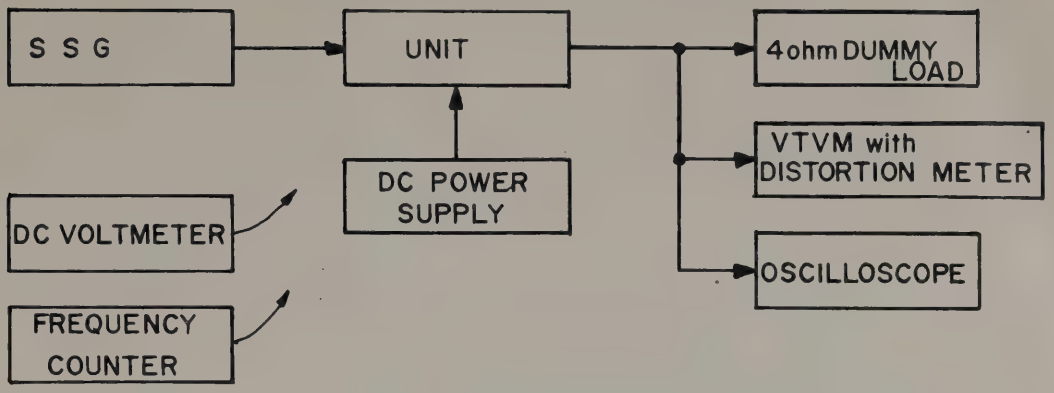
c) VTVM

d) Standard Signal Generator

e) DC Voltmeter

2. SETUP: Front panel controls should be set as same as local oscillator alignment, except SQUELCH control in fully counterclockwise position.

RECEIVER SETUP (IF SECTION)



3. PEOCEDURE

a) Connect 4 ohm load with VTVM and Oscilloscope to EXT SP jack.
b) Connect SSG (Standard Signal Generator) to antenna Jack.
c) Connect the unit to 13.8V DC power source and turn the power switch "ON".
d) Connect Frequency Counter to TP102(R138) and adjust TC101 for 16.445MHz reading on frequency counter.
e) Select channel 16 and set the frequency of SSG to 156.800MHz. Adjust L103, 104, 105 and 107 for maximum reading on VTVM.
f) Set RF output of SSG to 8dB and adjust squelch control fully clockwise position. Then adjust VR102 to the point where squelch just start to break.

TRANSMITTER

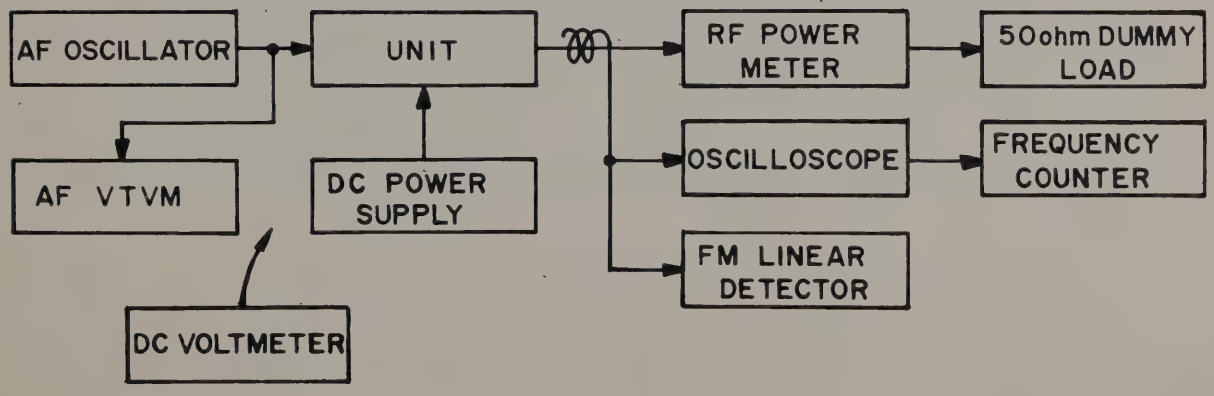
1. EQUIPMENT REQUIRED

a) 13.8V DC Power Source
b) RF Power Meter (50 watts)
c) Frequency Counter (10KHz to 200MHz)
d) RF Dummy load (50 ohms)
e) AF VTVM
f) DC Voltmeter
g) Audio Generator (1KHz, 120mV)
h) FM Linear Detector

2. SETUP

a) Power Switch : off
b) Squelch Control : any position
c) Hi-Low Power Switch : 25W position

TRANSMITTER SETUP



3. PROCEDURE

a) Connect the RF power meter with FM Linear detector and Frequency counter to the antenna connector. Set voltage of 13.8V power source to 11VDC.
b) Connect the unit to 11V power source and turn the power switch "ON".
c) Select the channel 16 and key the transmitter by grounding a pin 4 of microphone.

d) Connect the frequency counter to the point where C257 and TC208 are connected, then adjust TC210 to obtain 16.900MHz reading on the frequency counter.
e) Select the channel 26, and adjust TC209 for 12.300MHz reading, then select the channel 16.
f) Connect RF Voltmeter to TP201(R232) and adjust L206, 204, 203, 202, 201, 222 and 220 for maximum reading.
g) Select channel 26 and adjust TC208 for maximum reading.
h) Select channel 16 and adjust L206, 204, 203, 202, 201, 222, 220, TC206, 204, 205, 203 and 201 for maximum power output on the RF power meter.
i) Repeat above step (e thru h) for several times.
j) Connect DC Voltmeter to cathode of D202 and adjust TC201 and VR205 to obtain less than 1.0V reading.
k) Set the power supply voltage to 13.8VDC.
l) Set Hi-Low power switch to Low position and adjust VR203 for 1W on the RF power meter.
m) Set Hi-Low power switch to Hi position and adjust VR204 for 25W on the RF power meter.
n) Set AF Oscillator output level to 90mV and adjust VR302 for 4.7KHz deviation.
o) Set AF Oscillator output level to 3mV and adjust VR301 for 3.5KHz deviation.
p) Remove RF power meter from antenna connector and adjust VR202 to obtain 2.0 amp. reading on DC power supply's current meter. NOTE: THIS ADJUSTMENT MUST BE PERFORMED QUICKLY.

ALIGNMENT FOR ADDITIONAL CHANNEL INSTALLATION (WITHIN LEGAL CHANNELS)

NOTE: When installing a crystal as additional channel, proceed as follows:

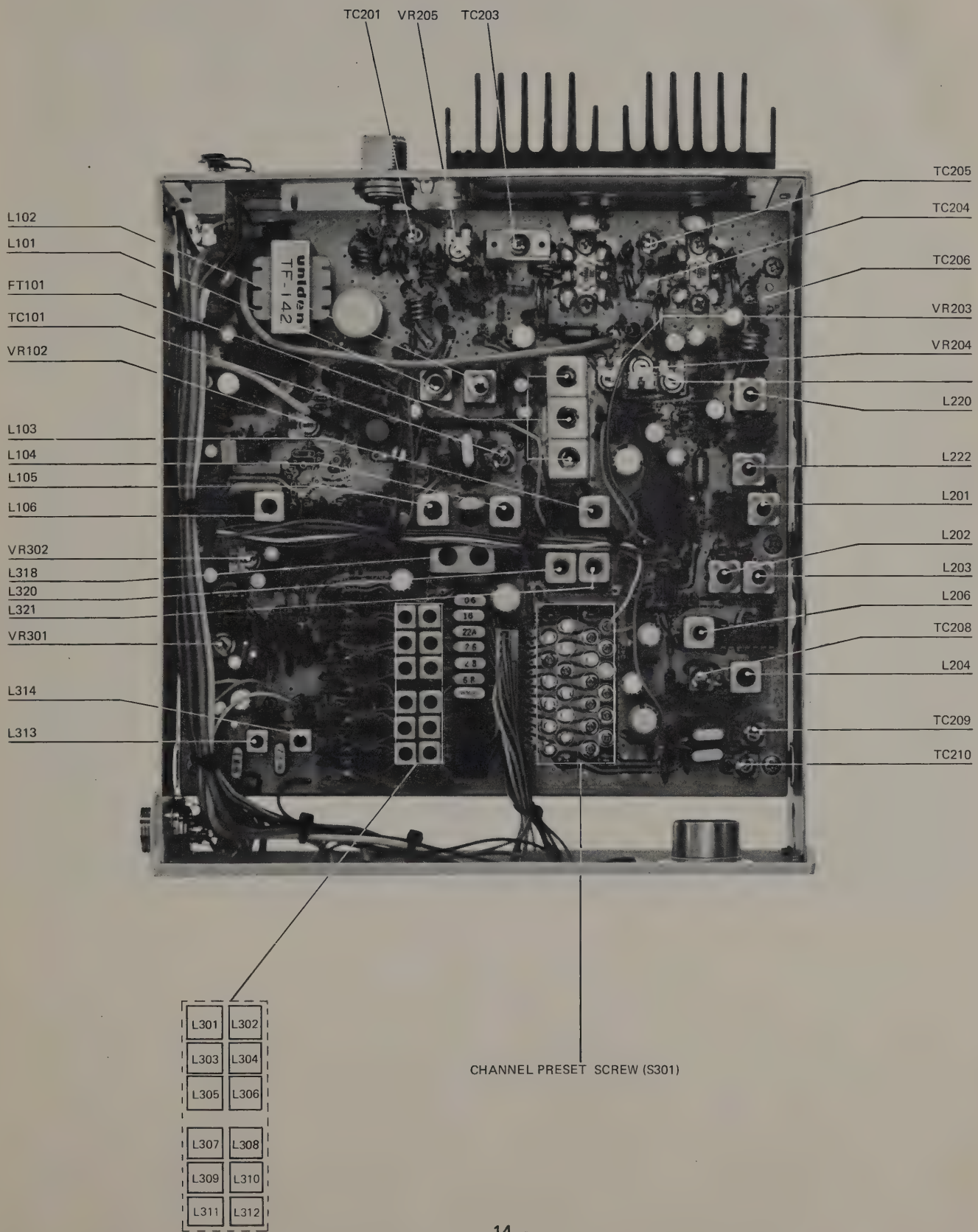
a) Place the desired channel's crystal into J302.
b) Place a screw into the corresponding screw hole on the P.C. Board (S301).
c) Connect the frequency counter between TP302 and TP301, then adjust the corresponding coil to obtain the following frequency.

Example

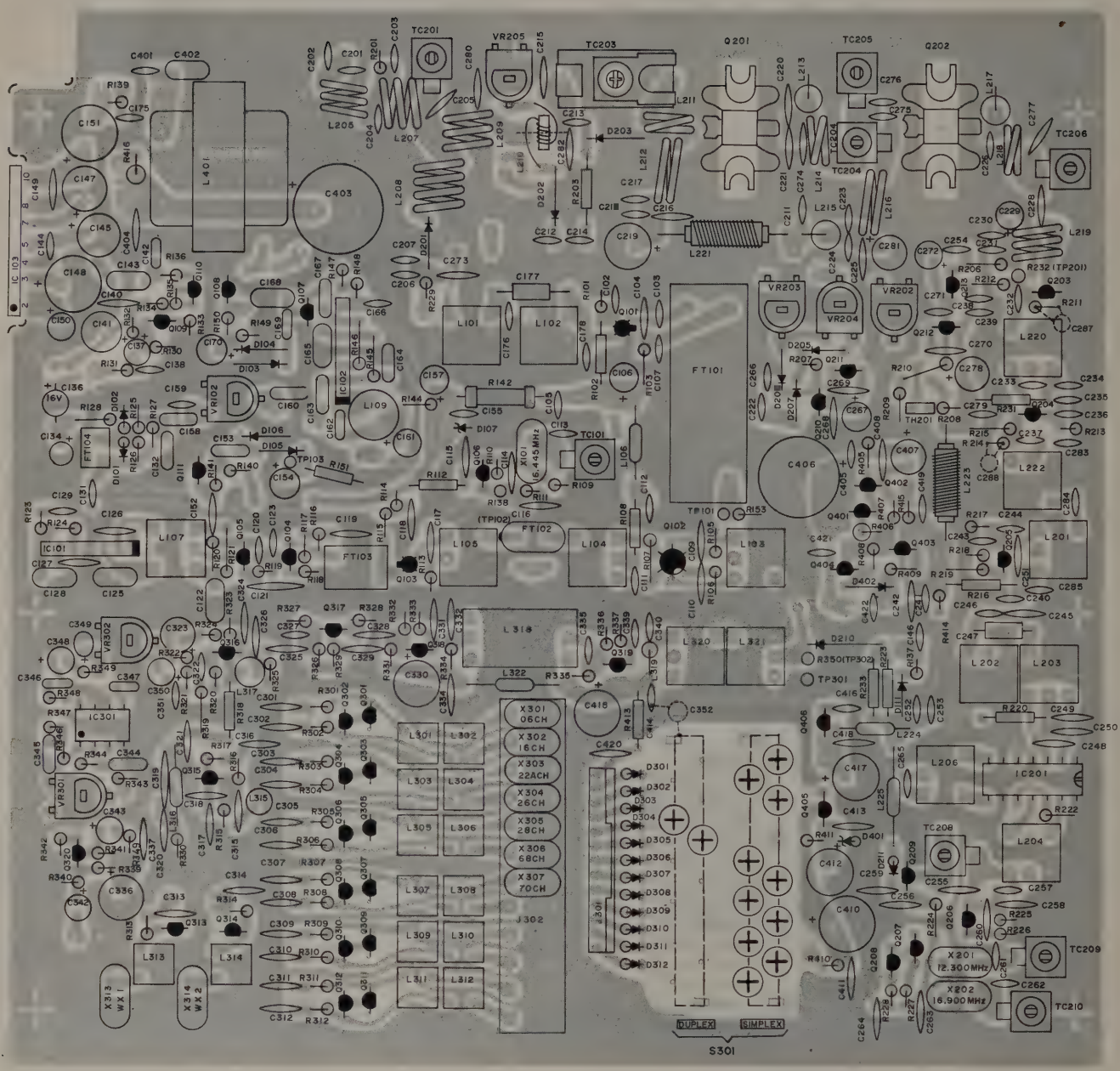
1. If you installed a crystal for channel 88 (157.425 MHz), then adjust for 140.525 MHz. [157.425—16.9 MHz (simplex)].
2. If you installed a crystal for channel 24 (161.8 MHz), then adjust for 149.5 MHz. [161.8—12.3 MHz (duplex)].

d) Repeat above step(a~c) for other channel installation.

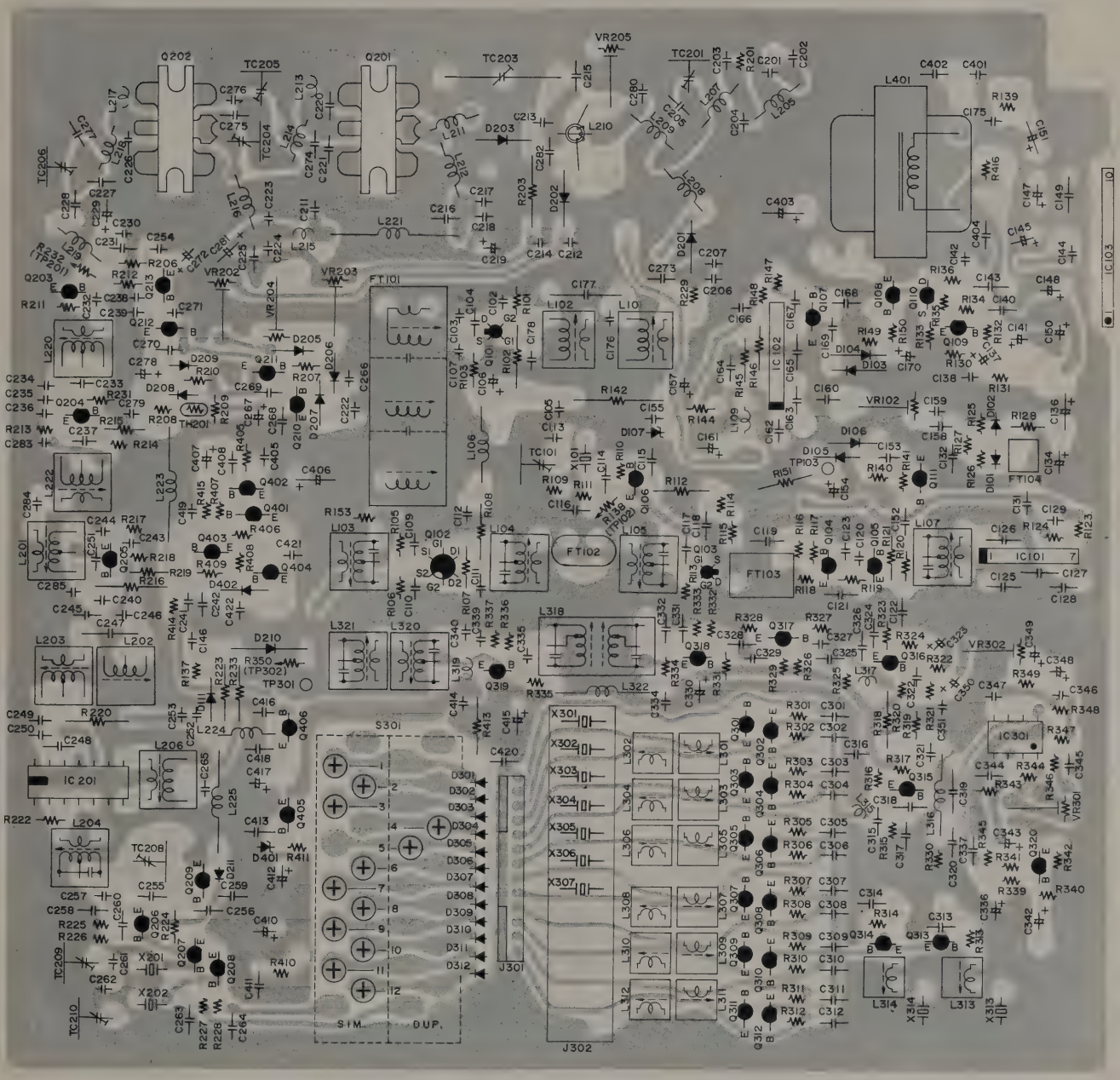
ALIGNMENT LOCATIONS



P.C. BOARD (TOP VIEW)



P.C. BOARD (BOTTOM VIEW)



REPLACEMENT PARTS LIST

CIRCUIT SYMBOL	DESCRIPTION		PART NO.
	SEMICONDUCTORS		
IC-101	Integrated Circuit,	μPC577H	DDEY064001
IC-102	Integrated Circuit,	TA7063P	DDEY008001
IC-103	Integrated Circuit,	HA1366W	DDEY119001
IC-201	Integrated Circuit,	SO42P	DDEY132001
IC-301	Integrated Circuit,	NJM4558D	DDEY145001
Q-110	Field Effect Transistor,	2SK68A-M	DDCY009002
Q-101,103	Field Effect Transistor,	3SK60	DDCY107001
Q-102	Field Effect Transistor,	E430	DDCY204001
Q212,402	Transistor,	2SA733P	DDBY003001
Q-401,403	Transistor,	2SB564L	DDBY103003
Q-107,108,109,210,211, 320,406	Transistor,	2SC945A-Q	DDBY224003
Q-405	Transistor,	2SC1317Q	DDBY232002
Q-201	Transistor,	2SC1946A	DDBY313001
Q-104,105,106,206,207, 208,209,301,302,303, 304,305,306,307,308, 309,310,311,312,313, 314,315,316,317,111	Transistor,	2SC1675L	DDBY259001
Q-204,205,318,319	Transistor,	2SC1730L	DDBY269001
Q-203	Transistor,	2SC2053	DDBY275001
Q-202	Transistor,	2SC2237	DDBY303001
Q-213,404	Transistor,	2SD471L	DDBY408003
D-101,102,203	Diode,	1N60P	DDAY001002
D-103,104,111,202,205, 206,207,211,301,302, 303,304,305,306,307, 308,309,310,311,402, 105,106	Diode,	1S2076	DDAY069001
D-210	Diode,	MC301	DDAY090001
D-201	Diode,	MI402	DDAY059001
D-501	Diode,	S3V10	DDAY068001
D-502	Diode, LED,	TLR124	DDAY100001
D-107	Diode, Zener,	BZ-081	DDAY009004
D-401	Diode, Zener,	WZ-094	DDAY008030
D-208,209	Varistor,	KB262	DDFY004001
TH-201	Thermistor,	ERT-D2FHL 1K ohm	DDFY006001
	INDUCTORS		
L-107	Coil,	LA-107	LLAY107001
L-201,220,222	Coil,	LA-132	LLAY132001
L-101,102	Coil,	LA-145	LLAY145001
L-318	Coil,	LA-243	LLAY243001
L-320,321	Coil,	LA-245	LLAY245001
L-103	Coil,	LA-246	LLAY246001
L-104	Coil,	LA-249	LLAY249001
L-105	Coil,	LA-252	LLAY252001
L-202	Coil,	LA-287	LLAY287001
L-203	Coil,	LA-288	LLAY288001
L-204	Coil,	LA-297	LLAY297001
L-206	Coil,	LA-298	LLAY298001
L-301,302,303,304,305, 306,307,308,309,310, 311,312,313,314	Coil,	LB-126	LLBY126001
L-215,221,223	Coil,	LD-012	LLDY012001

CIRCUIT SYMBOL	DESCRIPTION			PART NO.
	INDUCTORS (Continued)			
L-319	Coil,	LD-018	.....	LLDY018001
L-213,217	Coil,	LD-061	.....	LLDY061001
L-210	Coil,	LD-064	.....	LLDY064001
L-207,209,219	Coil,	LE-082	.....	LLEY082001
L-211	Coil,	LE-083	.....	LLEY083001
L-208	Coil,	LE-084	.....	LLEY084001
L-214,218	Coil,	LE-099	.....	LLEY099001
L-205	Coil,	LE-100	.....	LLEY100001
L-212,216	Coil,	LE-102	.....	LLEY102001
L-106,224,225,316,322	Inductor, Molded,	LZ-021	1.0μH	LLZY021002
L-317	Inductor, Molded,	LZ-002	4.7μH	LLZY002009
L-315	Inductor, Molded,	LZ-001	56μH	LLZY001010
L-109	Inductor, Molded,	LZ-003	2.7mH.....	LLZY003010
L-401	Coil AF Choke,	TF-142	.....	TTFY142001
	SEMI-FIXED & VARIABLE RESISTORS			
VR-205	Resistor, Semi-fixed,	RV-189	300 ohm B	RRVY189001
VR-204	Resistor, Semi-fixed,	RV-189	3K ohm B	RRVY189004
VR-302	Resistor, Semi-fixed,	RV-189	5K ohm B	RRVY189010
VR-102	Resistor, Semi-fixed,	RV-189	20K ohm B	RRVY189006
VR-202,203	Resistor, Semi-fixed,	RV-189	50K ohm B	RRVY189007
VR-301	Resistor, Semi-fixed,	RV-189	500K ohm B	RRVY189009
VR-501,S501	Resistor, Variable,	RV-008	S/10K ohm A (Vol./S)	RRVY008001
VR-502	Resistor, Variable,	RV-139	20K ohm B (SQ.)....	RRVY139001
	FIXED RESISTORS			
	NOTE: Resistor tolerance: J = ±5% K = ±10%			
R-406	Resistor, Metal Film,		0.5 ohm 1W K ...	RSJZ 105085
R-416	Resistor, Metal Film,		22 ohm 1W K ...	RSJZ 102205
R-142	Resistor, Metal Film,		100 ohm 1W K ...	RSJZ 101015
R-233	Resistor, Carbon, Axial Lead,		22 ohm 1/8W J ...	RPBZ 182204
R-108,112,220,231,413	Resistor, Carbon, Axial Lead,		100 ohm 1/8W J ...	RPBZ 181014
R-213,217	Resistor, Carbon, Axial Lead,		120 ohm 1/8W J ...	RPBZ 181214
R-216	Resistor, Carbon, Axial Lead,		220 ohm 1/8W J ...	RPBZ 182214
R-318	Resistor, Carbon, Axial Lead,		270 ohm 1/8W J ...	RPBZ 182714
R-138,203,232,350	Resistor, Carbon, Axial Lead,		1K ohm 1/8W J ...	RPBZ 181024
R-223	Resistor, Carbon, Axial Lead,		2.2K ohm 1/8W J ...	RPBZ 182224
R-151	Resistor, Carbon, Axial Lead,		10K ohm 1/8W J ...	RPBZ 181034
R-102	Resistor, Carbon, Axial Lead,		56K ohm 1/8W J ...	RPBZ 185634
R-206	Resistor, Carbon, Formed VERT,		5.6 ohm 1/8W J ...	RUBZ185694
R-103,410	Resistor, Carbon, Formed VERT,		10 ohm 1/8W J ...	RUBZ181004
R-118	Resistor, Carbon, Formed VERT,		12 ohm 1/8W J ...	RUBZ181204
R-324	Resistor, Carbon, Formed VERT,		33 ohm 1/8W J ...	RUBZ183304
R-121,222,317,325,329, 334	Resistor, Carbon, Formed VERT,		100 ohm 1/8W J ...	RUBZ181014
R-342	Resistor, Carbon, Formed VERT,		150 ohm 1/8W J ...	RUBZ181514
R-123,411	Resistor, Carbon, Formed VERT,		220 ohm 1/8W J ...	RUBZ182214
R-105,106,114,328,333	Resistor, Carbon, Formed VERT,		330 ohm 1/8W J ...	RUBZ183314
R-330	Resistor, Carbon, Formed VERT,		390 ohm 1/8W J ...	RUBZ183914
R-133,139,209,210,337	Resistor, Carbon, Formed VERT,		470 ohm 1/8W J ...	RUBZ184714
R-211	Resistor, Carbon, Formed VERT,		820 ohm 1/8W J ...	RUBZ188214
R-111,229,344,405,408	Resistor, Carbon, Formed VERT,		1K ohm 1/8W J ...	RUBZ181024
R-341,349	Resistor, Carbon, Formed VERT,		1.2K ohm 1/8W J ...	RUBZ181224
R-124,136,225,323,407	Resistor, Carbon, Formed VERT,		1.5K ohm 1/8W J ...	RUBZ181524

CIRCUIT SYMBOL	DESCRIPTION	PART NO.
	FIXED RESISTORS (Continued)	
R-115,415	Resistor, Carbon, Formed VERT, 1.8K ohm 1/8W J	RUBZ181824
R-128,131,140,208,414, 319	Resistor, Carbon, Formed VERT, 2.2K ohm 1/8W J	RUBZ182224
R-130,327	Resistor, Carbon, Formed VERT, 2.7K ohm 1/8W J	RUBZ182724
R-119,127,148,150,153, 214,218,332,336	Resistor, Carbon, Formed VERT, 3.3K ohm 1/8W J	RUBZ183324
R-116,134,409	Resistor, Carbon, Formed VERT, 4.7K ohm 1/8W J	RUBZ184724
R-201,301,302,303,304, 305,306,307,308,309, 310,311,312,313,314, 335,346,117	Resistor, Carbon, Formed VERT, 5.6K ohm 1/8W J	RUBZ185624
R-228	Resistor, Carbon, Formed VERT, 6.8K ohm 1/8W J	RUBZ186824
R-113,125,126,207,226, 321,340	Resistor, Carbon, Formed VERT, 10K ohm 1/8W J	RUBZ181034
R-212,227,326,331	Resistor, Carbon, Formed VERT, 12K ohm 1/8W J	RUBZ181234
R-144,215,219,224,316	Resistor, Carbon, Formed VERT, 15K ohm 1/8W J	RUBZ181534
R-132	Resistor, Carbon, Formed VERT, 18K ohm 1/8W J	RUBZ181834
R-101,109,110,137,146, 149,347,348	Resistor, Carbon, Formed VERT, 22K ohm 1/8W J	RUBZ182234
R-345	Resistor, Carbon, Formed VERT, 27K ohm 1/8W J	RUBZ182734
R-315,343	Resistor, Carbon, Formed VERT, 33K ohm 1/8W J	RUBZ183334
R-322	Resistor, Carbon, Formed VERT, 39K ohm 1/8W J	RUBZ183934
R-320	Resistor, Carbon, Formed VERT, 47K ohm 1/8W J	RUBZ184734
R-339	Resistor, Carbon, Formed VERT, 56K ohm 1/8W J	RUBZ185634
R-141	Resistor, Carbon, Formed VERT, 82K ohm 1/8W J	RUBZ188234
R-120,135,145	Resistor, Carbon, Formed VERT, 100K ohm 1/8W J	RUBZ181044
R-147	Resistor, Carbon, Formed VERT, 220K ohm 1/8W J	RUBZ182244
	CAPACITORS	

NOTE:
The first code indicates tolerance of capacitance:
C = ±0.25pF, **D** = ±0.5pF, **F** = ±1pF, **G** = ±2%, **J** = ±5%, **K** = ±10%, **M** = ±20%, **Z** = +70% -20%

The second code indicates variation of capacitance with temperature:
YA = ±5%, **YB** = ±10%, **YD** = +20 -30%, **YE** = +20 -50%, **YF** = +30 -80%, (-25 ~ +85°C), **ZF** = +30 -80% (-10 ~ +70°C), **CH** = 0±60ppm/°C, **RH** = -220ppm/°C±60ppm/°C, **CJ** = 0±120ppm/°C, **RJ** = -220ppm/°C±120ppm/°C, **TH** = -470ppm/°C±60ppm/°C, **UJ** = -750ppm°/C±120ppm/°C **SL** = +350ppm°/C ~ -1000ppm/°C,

C-149	Capacitor, Semiconductor,	0.22μF	12V	M	CGAZ212246
C-247	Capacitor, Composition,	0.82pF	500V	K	CBAZ828285
C-177	Capacitor, Composition,	0.56pF	500V	K	CBAZ825685
C-136	Capacitor, AL Solid,	0.1μF	16V	M	CAAZ311086
C-137	Capacitor, AL Solid,	0.22μF	16V	M	CAAZ312286
C-134	Capacitor, AL Solid,	0.33μF	16V	M	CAAZ313386
C-349	Capacitor, Tantalum,	1μF	25V	M	CSEZ511096
C-170	Capacitor, Electrolytic,	33μF	10V	.....	CELZ113300
C-145,147,157,323	Capacitor, Electrolytic,	47μF	10V	.....	CELZ114700
C-141,148	Capacitor, Electrolytic,	100μF	10V	.....	CELZ111010
C-151	Capacitor, Electrolytic,	470μF	10V	.....	CELZ114710
C-161	Capacitor, Electrolytic,	4.7μF	16V	.....	CELZ314790
C-154	Capacitor, Electrolytic,	10μF	16V	.....	CELZ311000
C-106,229,267,272,278, 281	Capacitor, Electrolytic,	33μF	16V	.....	CELZ313300
C-219,330,336,412,417	Capacitor, Electrolytic,	47μF	16V	.....	CELZ314700
C-410,415	Capacitor, Electrolytic,	220μF	16V	.....	CELZ312210
C-343,348,350	Capacitor, Electrolytic,	4.7μF	25V	.....	CELZ514790
C-407	Capacitor, Electrolytic,	10μF	25V	.....	CELZ511000

CIRCUIT SYMBOL	DESCRIPTION					PART NO.
	CAPACITORS (Continued)					
C-406	Capacitor, Electrolytic,	470μF	25V		.....	CELZ 514710
C-403	Capacitor, Electrolytic,	1000μF	25V		.....	CELZ 511020
C-150,342	Capacitor, Electrolytic,	1μF	50V		.....	CELZ 811090
C-347	Capacitor, Mylar,	0.001μF	50V	K	.....	CQMZ811025
C-160,164	Capacitor, Mylar,	0.0022μF	50V	K	.....	CQMZ812225
C-169	Capacitor, Mylar,	0.0033μF	50V	K	.....	CQMZ813325
C-158	Capacitor, Mylar,	0.0039μF	50V	K	.....	CQMZ813925
C-167	Capacitor, Mylar,	0.0047μF	50V	K	.....	CQMZ814725
C-163,346	Capacitor, Mylar,	0.0068μF	50V	K	.....	CQMZ816825
C-132,142,153,162,345	Capacitor, Mylar,	0.01μF	50V	K	.....	CQMZ811035
C-168	Capacitor, Mylar,	0.015μF	50V	K	.....	CQMZ811535
C-344	Capacitor, Mylar,	0.039μF	50V	K	.....	CQMZ813935
C-122,125,128,143,165, 402	Capacitor, Mylar,	0.047μF	50V	K	.....	CQMZ814735
C-270	Capacitor, Ceramic,	270pF	50V	J	SL	CCGZ812714
C-213	Capacitor, Ceramic,	1pF	50V	C	CH	CCCZ 811091
C-284	Capacitor, Ceramic,	6pF	50V	C	CH	CCCZ 816091
C-275,276,327	Capacitor, Ceramic,	10pF	50V	J	CH	CCCZ 811004
C-335	Capacitor, Ceramic,	12pF	50V	J	CH	CCCZ 811204
C-227	Capacitor, Ceramic,	18pF	50V	J	CH	CCCZ 811804
C-152	Capacitor, Ceramic,	22pF	50V	J	CH	CCCZ 812204
C-205	Capacitor, Ceramic,	27pF	50V	J	CH	CCCZ 812704
C-328	Capacitor, Ceramic,	39pF	50V	J	CH	CCCZ 813904
C-277,325	Capacitor, Ceramic,	47pF	50V	J	CH	CCCZ 814704
C-248	Capacitor, Ceramic,	1pF	50V	C	RH	CCRZ 811091
C-178,201,233,251,283	Capacitor, Ceramic,	2pF	50V	C	RH	CCRZ 812091
C-103,265	Capacitor, Ceramic,	3pF	50V	C	RH	CCRZ 813091
C-176	Capacitor, Ceramic,	4pF	50V	C	RH	CCRZ 814091
C-246	Capacitor, Ceramic,	5pF	50V	C	RH	CCRZ 815091
C-202,176	Capacitor, Ceramic,	6pF	50V	C	RH	CCRZ 816091
C-203,204,237,257,287	Capacitor, Ceramic,	10pF	50V	J	RH	CCRZ 811004
C-232	Capacitor, Ceramic,	12pF	50V	J	RH	CCRZ 811204
C-322	Capacitor, Ceramic,	15pF	50V	J	RH	CCRZ 811504
C-117,232,261	Capacitor, Ceramic,	22pF	50V	J	RH	CCRZ 812204
C-113,321,228,245,255, 282,262	Capacitor, Ceramic,	27pF	50V	J	RH	CCRZ 812704
C-274,280,	Capacitor, Ceramic,	33pF	50V	J	RH	CCRZ 813304
C-215	Capacitor, Ceramic,	39pF	50V	J	RH	CCRZ 813904
C-220,221	Capacitor, Ceramic,	47pF	50V	J	RH	CCRZ 814704
C-116	Capacitor, Ceramic,	100pF	50V	J	RH	CCRZ 811014
C-319	Capacitor, Ceramic,	150pF	50V	J	RH	CCRZ 811514
C-258,318	Capacitor, Ceramic,	220pF	50V	J	UJ	CCUZ 812214
C-114,260,268,269	Capacitor, Ceramic,	390pF	50V	J	UJ	CCUZ 813914
C-107,206,218,224,231, 236,239,244,249,253, 285	Capacitor, Ceramic,	150pF	50V	K	YB	CKBZ 811515
C-123	Capacitor, Ceramic,	390pF	50V	K	YB	CKBZ 813915
C-102,104,105,109,110, 111,112,120,129,138, 144,146,155,159,175, 207,211,212,214,217, 222,223,230,234,235, 238,240,241,243,250, 252,254,266,271,279, 339,340,351,401,405, 408,414,416,419,421, 422,502,503,504,352	Capacitor, Ceramic,	0.001μF	50V	K	YB	CKBZ 811025

CIRCUIT SYMBOL	DESCRIPTION	PART NO.
	CAPACITORS (Continued)	
C-115,131,140,166,242, 259,263,264,273,301, 302,303,304,305,306, 307,308,309,310,311, 312,313,314,315,316, 317,320,324,326,329, 331,332,404,411,413, 420,501	Capacitor, Ceramic, 0.01μF 50V Z YF	CKGZ 811030
C-216,225,256,334,337, 418	Capacitor, Ceramic, 0.022μF 25V Z YF	CKGZ 512230
C-118,119,121,126,127	Capacitor, Ceramic, 0.039μF 25V Z YF	CKGZ 513930
TC-101,201,204,205,206, 208,209,210	Capacitor, Trimmer, CV-024 20pF	CCVY 024003
TC-203	Capacitor, Trimmer, CV-051 100pF	CCVY 051001
	CRYSTALS	
X-101	Crystal, QX-068, 16.445 MHz	QQXY068005
X-201	Crystal, QX-089, 12.300 MHz	QQXY089001
X-202	Crystal, QX-091, 16.900 MHz	QQXY091001
X-301	Crystal, QX-101, 23.23333 MHz	QQXY101001
X-302	Crystal, QX-101, 23.31667 MHz	QQXY101003
X-303	Crystal, QX-101, 23.36667 MHz	QQXY101004
X-304	Crystal, QX-101, 24.16667 MHz	QQXY101006
X-305	Crystal, QX-101, 24.18333 MHz	QQXY101007
X-306	Crystal, QX-101, 23.25417 MHz	QQXY101008
X-307	Crystal, QX-101, 23.27083 MHz	QQXY101009
X-313	Crystal, QX-101, 24.27500 MHz	QQXY101010
X-314	Crystal, QX-101, 24.25000 MHz	QQXY101011
X-312	Crystal, QX-101, 24.26250 MHz	QQXY101012
	MISCELLANEOUS	
	PC Board, PC-520AA, Main PCB	PPCY 520011
FT-101	Resonator, Helical, FL-063, (B.P.F.)	FFLY 063001
FT-102	Filter, Crystal, FL-062, 16.9 MHz	FFLY 062001
FT-103	Filter, Ceramic, FL-068, 455 kHz	FFLY 068001
FT-104	Discriminator, Ceramic, FL-015	FFLY 015001
S-502	Switch, Rotary, SR-206, Channel Select	SSRY 206001
S-503,504,505	Switch, Push, SW-178	SSWY 178001
J-501	Connector, M Type, ANT, JK-035	JJKY 035001
J-503	Jack, Microphone, JK-058	JJKY 058001
J-502	Receptacle, DC Power, JK-052	JJKY 052001
SP-501	Speaker, SP-044	ASPY 044001
	Microphone, MK-112.....	AMKY112001
J-504,505	Jack, JK-010, EXT. SP, REMOTE SP.	JJKY 010001
PL-501	Pilot Lamp, PL-005	VPLY 005006
FS-501	Fuse, 6A FS-012	ZFSY 012002
TP-101,103,301	Terminal, Check Point, TP-019	JTPY 019001
J-301	Wire Connector, JK-122	JJKY 122012
	DC Power Cord, W-070272	WZDZ070272
	Clamper, Wire, YY-047.....	ZYYY047001
J-302	Socket, Crystal, SK-002	JSKY 002001
	Plug, PG-003, Accessory	JPGY 003001
	Chassis, Rear, (Ass'y)	MDBC307233
	Chassis, Left Side SPCC 1.0t ZMC	MDBP 307235
	Chassis, Right Side, SPCC 1.0t ZMC	MDBP 307236
	Thermal Conductor, AIP 3.0t	MDBP 307237
	Case, SPCC	MDBC307238

CIRCUIT SYMBOL	DESCRIPTION	PART NO.
	MISCELLANEOUS (Continued)	
	Mounting Bracket, SPCC 1.6t	MDBP 305668
	Hanger, Microphone, SPCC 1.0t Ni-3	MDBP 402919
	Connecting Plate, BsP 0.6t Ag-3	MDBP 407239
	Bracket, Speaker, SPCC 0.8t ZMC	MCBP 400048
	Holder, IC,	MDBP 405177
	Holder, Switch,	MDBP 407240
	Panel, Front,	MDMP207241
	Knob, Channel,	MDMP407242
	Knob,	MDMP407243
	Disk, Channel Display,	MDMP405674
	Holder, LED,	MDMP403877
	Cap, Jack,	MDMP405954
	Screw, Mounting,	MDMC405736
	Heat Sink,	MDEP 405942
	Nameplate, Brand, A1P 0.3t	MDNP407244
	Plate, Rear Chassis, A1P 0.1t	MDNP407245
	Optical Filter, 1.0t	MDAP405693
	Gasket, Rubber, 1.0t	MDZP 305684
	Gasket, Rubber,	MDZP 405685
	Protection Cover, Front Panel,	MDZP 307246
	Washer, Fiber, 6.5d X 15D x 1t	MDZP 402177
	Spacer, 1.0t	MDZP 405682
	Insulation Plate, 0.5t	MDZP 405956
	Foot,	MZTT 010011
	Bushing, Rubber	MZTT 030012
	Vinyl Bag, Fuse,	MZTT 110608
	Vinyl Bag, Miscellany,	MZTT 111012
	Vinyl Bag, Microphone,	MZTT 111160
	Vinyl Bag, Cords,	MZTT 111228
	Vinyl Bag, Printed Matters,	MZTT 112032
	Vinyl Bag, Unit,	MZTT 123245
	Spring Plate, Channel Knob,	MZTT 200003
	Label, Serial No.	MDLP 401500
	Label, Warning, DC Cord,	MDLP 403326
	Screw, Flat Hd, Ni, M3 x 6	MZSN 133006
	Screw, Bind Hd, Ni, M3 x 6	MZSN 193006
	Screw, Bind Hd, Ni, M3 x 8	MZSN 193008
	Screw, Bind Hd, Ni, M3 x 10	MZSN 193010
	Tapping Screw, Pan Hd, 2ϕ x 5	MZSN 252005
	Tapping Screw, Bind Hd, ZMC, 3ϕ x 8	MZSZ 263008
	Tapping Screw, Round Hd, ZMC, 3.5ϕ x 8	MZSZ 293508
	Tapping Screw, Round Hd, ZMC, 5ϕ x 10	MZSZ 295010
	Tap Tight Screw, Bind Hd, ZMC, M3 x 6	MZSZ 343006
	Tap Tight Screw, Bind Hd, ZMC, M3 x 8	MZSZ 343008
	Tap Tight Screw, Bind Hd, ZMC, M3 x 14	MZSZ 343014
	Nut, Hex, Ni, M3	MZSN 430030
	Washer, Flat, Ni,	MZSN 490030
	Washer, Flat, Ni,	MZSN 500030
	Washer, Spring, Ni,	MZSN 510030
	Washer, Lock, ZMC,	MZSZ 530030
	Washer, Lock, ZMC,	MZSZ 530035
	Washer, Star, ZMC,	MZSZ 540050
	Retainer, CS Type, Channel Disk,	MZSP 570010
	Styrofoam Pad,	MDPP 305688
	Styrofoam Pad,	MDPP 305689
	Display Box,	MDPP 307247
	Shipping Carton Box,	NDPP 407249
	Channel Display Seal,	MDPP 405735
	Owners Manual,	MZPZ 710001
	FCC Application Form,	MZPY 000019
	Warranty Card	MZPZ 709004

VHF FM MARINE RADIOTELEPHONE CHANNELS AND FUNCTIONS
(U.S.A. CHANNELS)

CHANNEL DESIG	FREQUENCY (MHz)		TYPE TRAFFIC	FUNCTION	
	TX	RX		SHIP TO SHIP	SHIP TO SHORE
01(WX1)	–	162.550	ESSA Weth	Receive Only	Receive Only
02(WX2)	–	162.400	ESSA Weth	Receive Only	Receive Only
03(WX3)	–	162.475	ESSA Weth	Receive Only	Receive Only
04	–	161.650	Canadian Weth	Receive Only	Receive Only
05	–	160.850	Int'l	Receive Only	Receive Only
06	156.300	156.300	Safety	Yes	No
07(A)	156.350	156.350	Com'l	Yes	Yes
08	156.400	156.400	Com'l	Yes	No
09	156.450	156.450	Com'l & Non Com'l	No	Yes
10	156.500	156.500	Com'l	Yes	Yes
11	156.550	156.550	Com'l	Yes	Yes
12	156.600	156.600	Port Op	Yes	Yes
13	156.650	156.650	Nav.	Yes	Yes
14	156.700	156.700	Port Op	Yes	Yes
15	–	156.750	Weather P.	Receive Only	Receive Only
16	156.800	156.800	Safety C	Yes	Yes
17	156.850	156.850	State Con	No	Yes
18(A)	156.900	156.900	Com'l	Yes	Yes
19(A)	156.950	156.950	Com'l	Yes	Yes
20	157.000	161.600	Port Op	No	Yes
21(CG)	157.050	157.050	Coast Ga'd	Yes	Yes
22(CG)	157.100	157.100	Coast Ga'd	Yes	Yes
23(CG)	157.150	157.150	Coast Ga'd	Yes	Yes
24	157.200	161.800	Public C	No	Yes
25	157.250	161.850	Public C	No	Yes
26	157.300	161.900	Public C	No	Yes
27	157.350	161.950	Public C	No	Yes
28	157.400	162.000	Public C	No	Yes
30	–	153.950	Public S	Receive Only	Receive Only
31	–	154.175	Public S	Receive Only	Receive Only
32	–	154.250	Public S	Receive Only	Receive Only
33	–	154.400	Public S	Receive Only	Receive Only
34	–	154.650	Public S	Receive Only	Receive Only
35	–	154.725	Public S	Receive Only	Receive Only
36	–	154.800	Public S	Receive Only	Receive Only
37	–	154.875	Public S	Receive Only	Receive Only
38	–	154.950	Public S	Receive Only	Receive Only
39	–	155.250	Public S	Receive Only	Receive Only
40	–	155.325	Public S	Receive Only	Receive Only
41	–	155.400	Public S	Receive Only	Receive Only
42	–	155.475	Public S	Receive Only	Receive Only
43	–	155.550	Public S	Receive Only	Receive Only
44	–	155.625	Public S	Receive Only	Receive Only
45	–	155.700	Public S	Receive Only	Receive Only
46	–	155.850	Public S	Receive Only	Receive Only
47	–	156.150	Public S	Receive Only	Receive Only
48	–	158.850	Public S	Receive Only	Receive Only
49	–	159.150	Public S	Receive Only	Receive Only
50	–	155.025	Public S	Receive Only	Receive Only
51	–	155.775	Public S	Receive Only	Receive Only
52	–	155.925	Public S	Receive Only	Receive Only
53	–	156.000	Public S	Receive Only	Receive Only
54	–	156.225	Public S	Receive Only	Receive Only
55	–	154.025	Public S	Receive Only	Receive Only
56	–	154.100	Public S	Receive Only	Receive Only
60	–	160.625	Public S	Receive Only	Receive Only
61	–	160.675	Public S	Receive Only	Receive Only
62	–	160.725	Public S	Receive Only	Receive Only
63	–	160.775	Public S	Receive Only	Receive Only
64	–	160.825	Public S	Receive Only	Receive Only
65(A)	156.275	156.275	Port Op	Yes	Yes
66(A)	156.325	156.325	Port Op	Yes	Yes
67	156.375	156.375	Com'l	Yes	No
68	156.425	156.425	Non Com'l	Yes	Yes
69	156.475	156.475	Non Com'l	Yes	Yes
70	156.525	156.525	Non Com'l	Yes	No
71	156.575	156.575	Non Com'l	Yes	Yes
72	156.625	156.625	Non Com'l	Yes	No
73	156.675	156.675	Port Op	Yes	Yes
74	156.725	156.725	Port Op	Yes	Yes
77	156.875	156.875	Com'l	Yes	No
78(A)	156.925	156.925	Non Com'l	Yes	Yes
79(A)	156.975	156.975	Com'l	Yes	Yes
80	157.025	157.025	Com'l	Yes	Yes
81	157.075	157.075	Coast Ga'd	Yes	Yes
82	–	161.725	US Govn Only	Receive Only	Receive Only
83(CG)	157.175	157.175	Coast Ga'd A	Yes	Yes
84	157.225	161.825	Public C	No	Yes
85	157.275	161.875	Public C	No	Yes
86	157.325	161.925	Public C	No	Yes
87	157.375	161.975	Public C	No	Yes
88(A)	157.425	157.425	Com'l	Yes	No

VHF FM MARINE RADIOTELEPHONE CHANNELS AND FUNCTIONS
(INTERNATIONAL CHANNELS)

CHANNEL DESIG	FREQUENCY (MHz)		TYPE TRAFFIC	FUNCTION	
	TX	RX		SHIP TO SHIP	SHIP TO SHORE
1	156.050	160.650	Int'l Only	–	Yes
2	156.100	160.700	Int'l Only	–	Yes
3	156.150	160.750	Int'l Only	–	Yes
4	156.200	160.800	Int'l Only	–	Yes
5	156.250	160.850	Int'l Only	–	Yes
6	156.300	156.300	Safety	Yes	No
7	156.350	160.950	Int'l Only	Yes	Yes
8	156.400	156.400	Com'l	Yes	No
9	156.450	156.450	Com'l	No	Yes
10	156.500	156.500	Com'l	Yes	Yes
11	156.550	156.550	Com'l	Yes	Yes
12	156.600	156.600	Port Op.	Yes	Yes
13	156.650	156.650	Nav.	Yes	Yes
14	156.700	156.700	Port Op.	Yes	Yes
15	–	156.750	Weth P.	Receive Only	Receive Only
16	156.800	156.800	Safety C.	Yes	Yes
17	156.850	156.850	State Cont.	No	Yes
18	156.900	161.500	Int'l Only	Yes	Yes
19	156.950	161.550	Int'l Only	Yes	Yes
20	157.000	161.600	Port Op.	No	Yes
21	157.050	161.650	Int'l Only	–	Yes
22	157.100	161.700	Coast Ga'd	Yes	Yes
23	157.150	161.750	Int'l Only	–	Yes
24	157.200	161.800	Public C.	No	Yes
25	157.250	161.850	Public C.	No	Yes
26	157.300	161.900	Public C.	No	Yes
27	157.350	161.950	Public C.	No	Yes
28	157.400	162.000	Public C.	No	Yes
60	156.025	160.625	Int'l Only	Yes	Yes
61	156.075	160.675	Int'l Only	Yes	Yes
62	156.125	160.725	Int'l Only	Yes	Yes
63	156.175	160.775	Int'l Only	Yes	Yes
64	156.225	160.825	Int'l Only	Yes	Yes
65	156.275	160.875	Int'l Only	Yes	Yes
66	156.325	160.925	Int'l Only	Yes	Yes
67	156.375	156.375	Com'l	Yes	No
68	156.425	156.425	Non Com'l	No	Yes
69	156.475	156.475	Non Com'l	No	Yes
70	156.525	156.525	Non Com'l	Yes	No
71	156.575	156.575	Non Com'l	No	Yes
72	156.625	156.625	Non Com'l	Yes	No
73	156.675	156.675	Port Op.	Yes	Yes
74	156.725	156.725	Port Op.	Yes	Yes
77	156.875	156.875	Com'l	Yes	No
78	156.925	161.525	Int'l Only	Yes	Yes
79	156.975	161.575	Int'l Only	Yes	Yes
80	157.025	161.625	Int'l Only	Yes	Yes
81	157.075	161.675	Int'l Only	–	Yes
82	157.125	161.725	Int'l Only	–	Yes
83	157.175	161.775	Int'l Only	–	Yes
84	157.226	161.825	Public C.	No	Yes
85	157.275	161.875	Public C.	No	Yes
86	157.325	161.925	Public C.	No	Yes
87	157.375	161.975	Public C.	No	Yes
88	157.425	162.025	Int'l Only	Yes	Yes

#13
#70
#25

CAUTION: OPERATION OF CHANNELS NOT DESIGNATED FOR USES BY YOUR CLASSIFICATION OF CRAFT OR ON INTERNATIONAL CHANNELS WHEN WITHIN UNITED STATES TERRITORIAL WATERS IS A VIOLATION OF FEDERAL COMMUNICATIONS COMMISSION RULES AND REGULATIONS AND MAY RESULT IN SEVERE PENALITIES.

SHIPS RADIO LOG

VESSEL NAME Bleus

CALL LETTERS WXM 9601

TRANSMITTER MODEL "1400"

TRANSMITTER SERIAL NUMBER K 3659

FREQUENCY CHECK: –

Channel 06	156.300	MHz	Variance		Hz
Channel 16	156.800	MHz	Variance		Hz
Channel 22A	157.100	MHz	Variance		Hz
Channel 26	157.300	MHz	Variance		Hz
Channel 28	157.400	MHz	Variance		Hz
Channel 68	156.425	MHz	Variance		Hz
Channel		MHz	Variance		Hz
Channel		MHz	Variance		Hz
Channel		MHz	Variance		Hz
Channel		MHz	Variance		Hz
Channel		MHz	Variance		Hz
Channel		MHz	Variance		Hz
Channel		MHz	Variance		Hz
Channel		MHz	Variance		Hz

all within ±500~

MODULATION: ±5 kHz Peak Deviation

Measurements made using 50 ohms dummy load.

REMARKS:

DATE CHECKED 3/10/80

COMPANY

TECHNICIAN DONALD E. CARPENTER PI-3-14088 EXPIRES 6/15/83

FCC LICENSE NUMBER

CALL LETTERS WXM-9601

SHIP NAME Bleu

Date & Time	Station Called	Channel Freq.	Operator	Time of Ending Contact	My Location and Reason For Call

SEMICONDUCTORS VOLTAGE CHART

Note: Voltages were measured by V.T.V.M. at channel frequency of 156.8 MHz

INTEGRATED CIRCUIT

CIRCUIT SYMBOL & TYPE NUMBER	Integrated Circuit Pin Number													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC101 μPC577H	5.6	2.7	3.3	0	1.8	1.8	4.8							
IC102 TA7063P	1.5	0.7	0.1	0	0.9	4.7	8.1							
IC103 HA1366W	0	13.8	8.9	0.02	1.2	0	13.5	0	0	7.0				
IC201 S042P	0	7.9	7.9	0	7.8	0	2.8	2.8	0	0.6	1.3	0.6	1.3	0
IC301 NJM4558D	4.7	4.8	4.8	0	4.7	4.8	4.8	8.6						

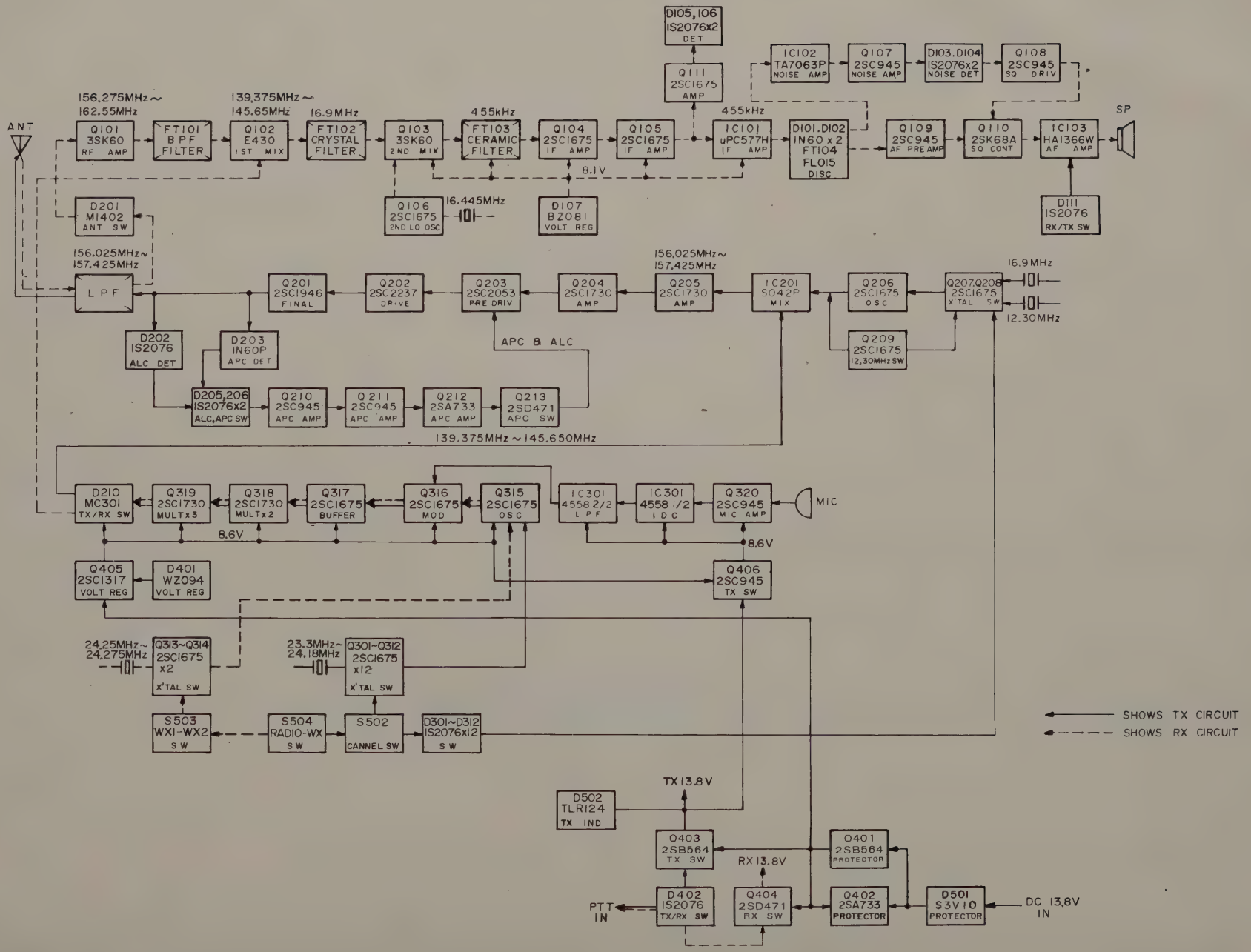
FIELD EFFECT TRANSISTOR

CIRCUIT SYMBOL	TYPE NUMBER	1st Gate	2nd Gate	Source	Drain	Remarks
Q101	3SK60	0	3.6	0	12.6	
Q103	3SK60	0	0	0	7.4	
Q110	2SK68A-M	3.9(3.8)	–	3.9 (0.01)	3.95 (0.6)	(Squelched)
Q102	E430	1st Gate		1st Source	1st Drain	
		0		1.35	11.8	
		2nd Gate		2nd Source	2nd Drain	
		0		1.45	11.8	

TRANSISTOR

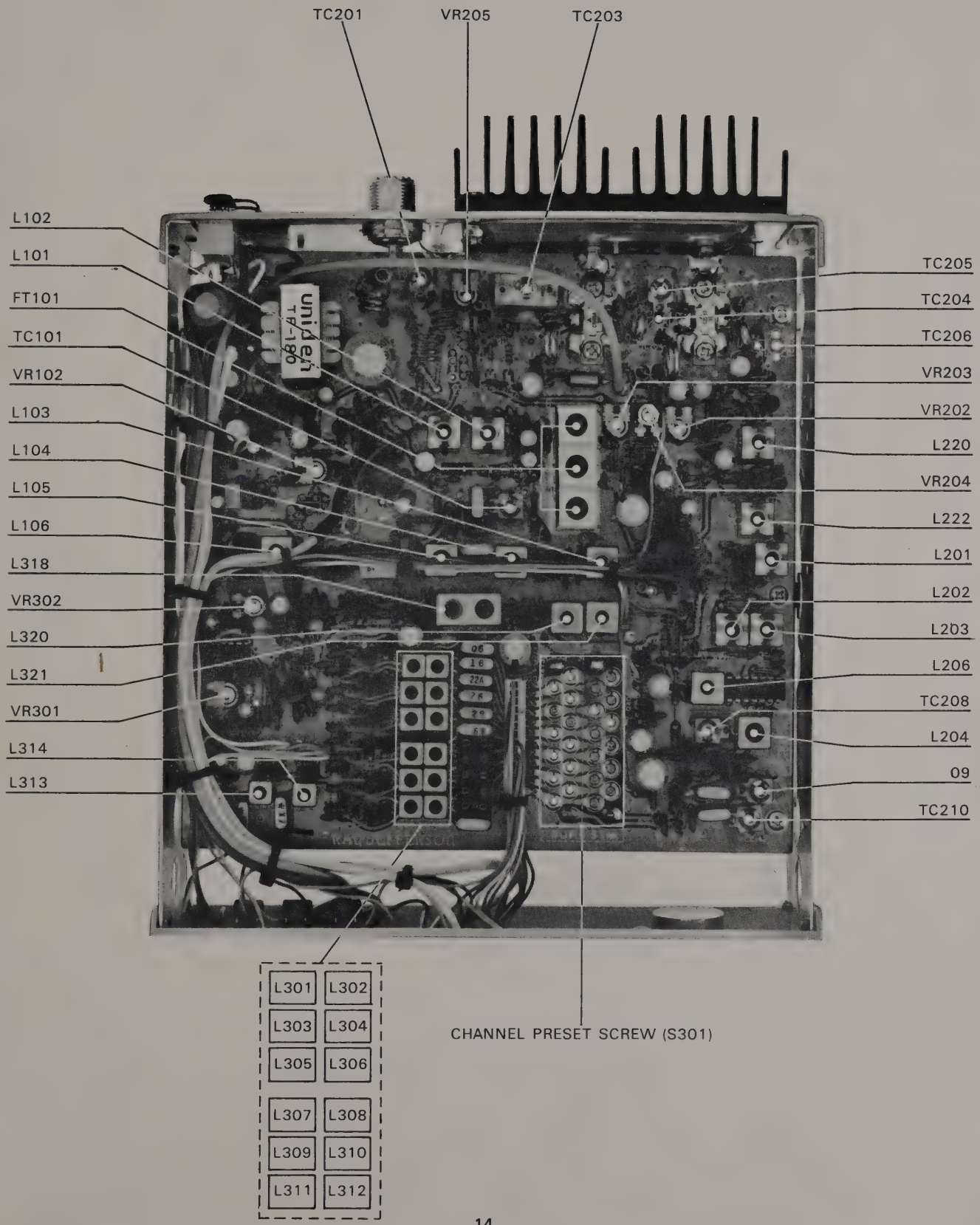
CIRCUIT SYMBOL	TYPE NUMBER	Base	Emitter	Collector	Remarks
Q104	2SC1675L	0.7	0.03	0.9	
Q105	2SC1675L	6.5	5.8	8.0	
Q106	2SC1675L	3.6	3.0	7.8	
Q107	2SC945AQ	0.6 (0.5)	0	2.7 (3.3)	(Squelched)
Q108	2SC945AQ	0 (0.6)	0	3.9 (0.01)	(Squelched)
Q109	2SC945AQ	1.0	0.4	3.9	
Q111	2SC1675L	0.7	0	2.7	
Q201	2SC1946A	0	0	13.5	
Q202	2SC2237	0	0	13.5	
Q203	2SC2053	0.6 (0.6)	0	5.2 (2.4)	(Low Power)
Q204	2SC1730L	2.1	1.4	12.0	
Q205	2SC1730L	2.0	1.3	10.7	
Q206	2SC1675L	4.1 (2.7)	3.5 (2.1)	7.9 (7.9)	(Duplex)
Q207	2SC1675L	0 (3.3)	0.2 (2.7)	4.2 (2.7)	(Duplex)
Q208	2SC1675L	4.9 (0)	4.2 (0)	4.2 (2.7)	(Duplex)
Q209	2SC1675L	0 (0.6)	0 (0)	0 (0)	(Duplex)
Q210	2SC945AQ	0.6 (0.61)	0 (0)	2.2 (0.9)	(Low Power)
Q211	2SC945AQ	2.2 (0.9)	1.6 (0.5)	12.3 (12.4)	(Low Power)
Q212	2SA733P	12.3 (12.4)	13.2 (13.5)	5.5 (3.1)	(Low Power)
Q213	2SD471L	5.5 (3.1)	4.9 (2.5)	13.2 (13.4)	(Low Power)
Q301	2SC1675L	0	0	0	
Q302	2SC1675L	0.7	0	0	
Q303	2SC1675L	0	0	0	
Q304	2SC1675L	0	0	0	
Q305	2SC1675L	0	0	0	
Q306	2SC1675L	0	0	0	
Q307	2SC1675L	0	0	0	
Q308	2SC1675L	0	0	0	
Q309	2SC1675L	0	0	0	
Q310	2SC1675L	0	0	0	
Q311	2SC1675L	0	0	0	
Q312	2SC1675L	0	0	0	
Q313	2SC1675L	0.7	0	0	WX1
Q314	2SC1675L	0	0	0	
Q315	2SC1675L	4.2	3.6	7.9	
Q316	2SC1675L	3.6	2.9	8.6	
Q317	2SC1675L	1.6	1.0	8.5	
Q318	2SC1730L	1.8	1.3	8.4	
Q319	2SC1730L	2.9	2.3	8.7	
Q320	2SC945AQ	1.1	0.5	4.4	
Q401	2SB564L	13.0	13.8	13.7	
Q402	2SA733P	13.7	13.8	13.0	
Q403	2SB564L	13.2 (0)	13.7 (13.4)	0 (13.4)	(TX)
Q404	2SD471L	13.3 (0.6)	12.6 (0.1)	13.7 (13.4)	(TX)
Q405	2SC1317Q	9.4	8.7	13.2	
Q406	2SC945AQ	0 (9.3)	0 (8.6)	8.7 (8.6)	(TX)

FUNCTIONAL BLOCK DIAGRAM



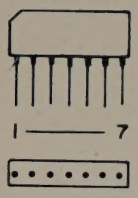
REVISION

ALIGNMENT LOCATIONS

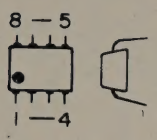


SEMICONDUCTORS PIN CONFIGURATION

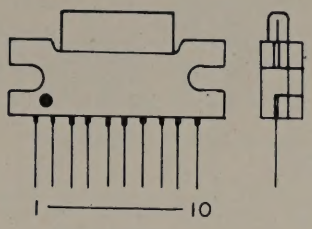
μPC577H
TA7063P



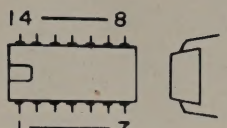
NJM4558D



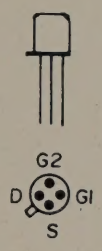
HA1366W



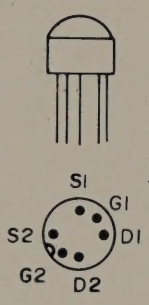
S042P



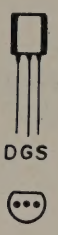
3SK60



E430

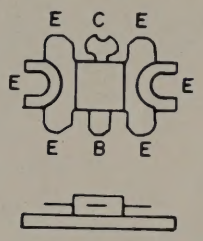


2SK68A-M



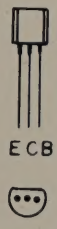
2SC2053

2SC1946A
2SC2237

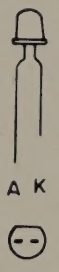


2SA733P
2SB564L
2SC945A-Q

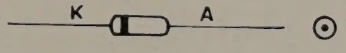
2SC1317Q
2SC1675L
2SC1730L
2SD471L



TLR124



IN60P



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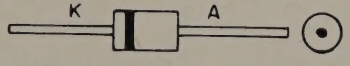

WZ094
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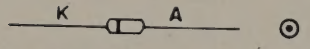
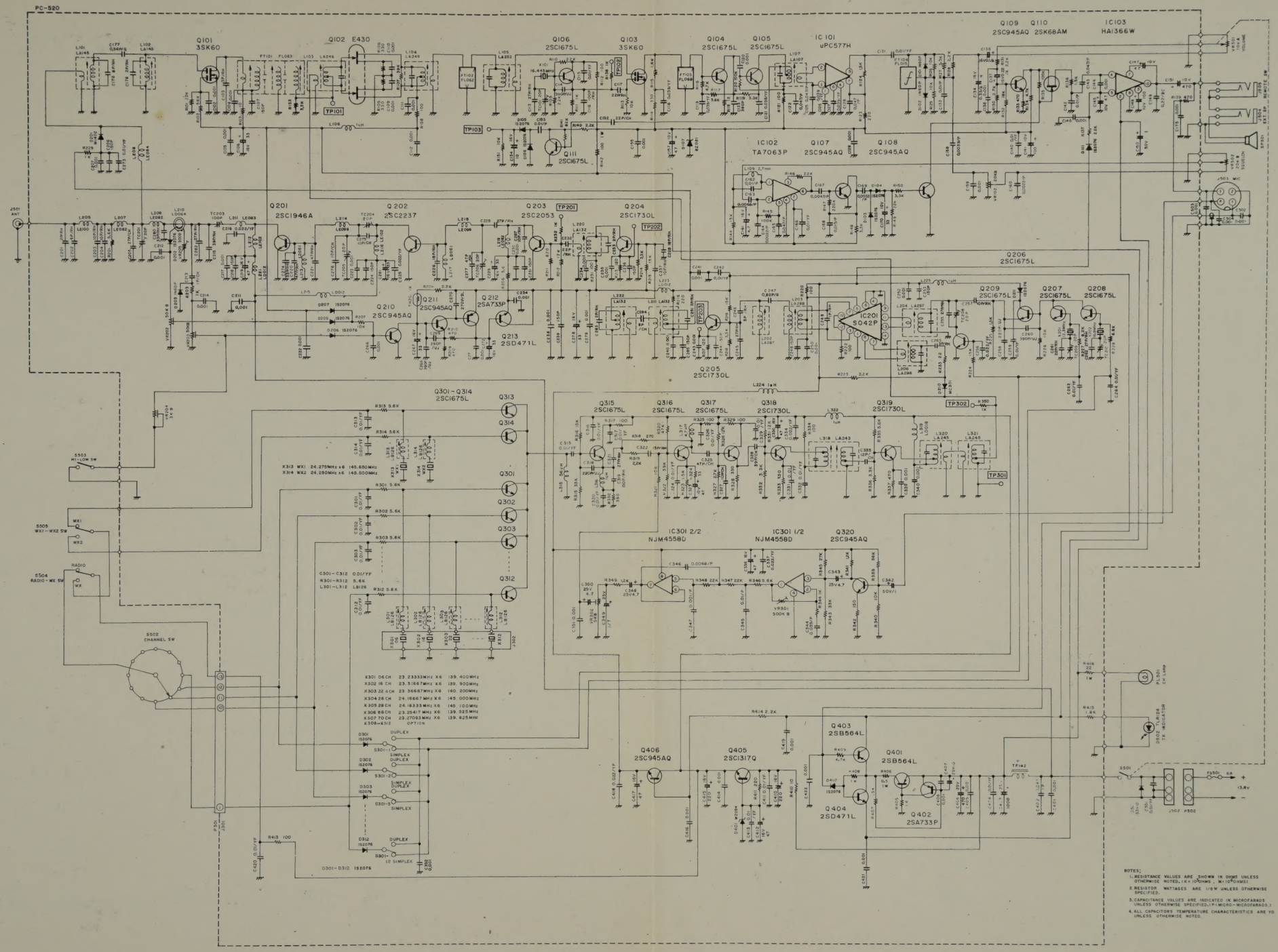
M1402
MC301
IS2076



SCHEMATIC DIAGRAM



SR K 3659

bought June 14th 1980

RAY JEFFERSON LIMITED WARRANTY

This unit is fully covered by our limited warranty. It will give you dependable service and long life under nomal conditions encountered in marine use.
The limited warranty is as follows:

Components: Ray Jefferson warrants every component of the equipment, with the exception of transistors, to be free from any defects caused by poor workmanship or faulty materials. Under the warranty, Ray Jefferson is liable only to the repair, or, at Ray Jefferson option, the replacement, without charge, of any component found to be defective under normal use within 3 mos. of the date of Ray Jefferson shipment, if the following conditions are met.

(1) Ray Jefferson must be promptly notified, in writing, upon discovery of any such defects.

(2) The defective components must be returned to Ray Jefferson, transportation prepaid, and

(3) Ray Jefferson examination must disclose to its satisfaction that defects have not been caused by abuse.

Warranty is voided unless registration card is returned to the factory within 10 days after purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment to affect their stability or reliability, or which have been subjected to misuse, negligence, or accident, or which have had the serial number altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories not manufactured by us are not covered by the warranty. No equipment manufuctured by Ray Jefferson is warranted in any respect if it has been repaired or altered other than at authorized service agenecies.

This warranty is in lieu of all other warranties expressed or implied and no representatives or persons are authorized to assume for us any other liability in connection with the sale of our products.

CONSEQUENTIAL DAMAGE:

Ray Jefferson shall not be held liable for any damage of a special or consequential nature with respect to merchandise sold or delivered, or service rendered.

Ray Jefferson reserves the right to perform modifications or improvements on its products without incurring obligation to install the changes on previously sold equipment.

This warranty gives you specific regal rights, and you may also have other rights which vary from state to state.

RAY JEFFERSON

DIVISION OF JETRONIC INDUSTRIES, INC.

MAIN & COTTON STREETS PHILADELPHIA, PA. 19127

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